Indian Institute of Foreign Trade

SURVEY of INDIA'S EXPORT POTENTIAL of MARINE PRODUCTS

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SURVEY
OF
INDIA'S EXPORT POTENTIAL
OF
MARINE PRODUCTS

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VOLUME IV

Survey of India's Export Potential of Marine Products

VOLUME IV

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1. COMMODITY REVIEW

1.1 Shrimp

Background

Shrimp is an important fishery although its annual average world catch constitutes only one per cent of the total world fish landings. Shrimp landings of world in 1968 amounted to 771,000 tonnes against the total fish landings of 64.0 million tonnes. In the field of international trade also shrimp occupies a prominent place amongst all the seafood products. The world trade of shrimp has shown rapid increase year after year and during 1968 it was of the order of 74,200 tonnes valued at $ 143 million.

Species

Shrimp is broadly classified into two groups: penaeid and non-penaeid prawns. Prawn and shrimp are considered almost synonymous in definition, the only distinction being that in common usage larger varieties are called prawns and smaller ones shrimp. Although the number of species of shrimp and prawns identified throughout the world runs into hundreds, popular species are only about twenty. Of the 10 species of shrimp, commercially important species are: Metapenaeus dobsoni, Metapenaeus affinis, Barapenaeopsis stylifera, Penaeus indicus and Penaeus carinatus, known in

India as Poovalan, Kazhanthan, Karikkadi, Naran, and Kara chemmeen respectively. These are known as white, pink, brown and tiger shrimps in trade circles. The penaeid group of prawns, being larger in size, enjoy an over-riding commercial significance. Other species of lesser importance are Metapenaeus brevicornis, Penaeus monodon, Parapenaeopsis sculptilis, Parapenaeopsis hardwickii and solenocera indica.

The important species of shrimp, Metapenaeus dobsoni, is available all along the Indian coast except the northern part of the West coast. The South West coast is the best fishing ground for shrimp and yields substantial quantities of this species. Whereas Metapenaeus affinis, Penaeus indicus and Penaeus monoceros species of shrimp are mainly found both in the East and West coasts, Metapenaeopsis stylifera is fished only from the West coast. The other species of relatively lesser importance such as Metapenaeus brevicornis, Parapenaeopsis sculptilis, Parapenaeopsis hardwickii and Solenocera indica are available in limited quantities in the North West and North East coasts of India.

Metapenaeus dobsoni has the longest fishing season extending from October to June. For Metapenaeus affinis

there are two short seasons every year, one in the months of May-June and the other during November-December. Similarly Parapenaeopsis stylifera has two fishing seasons in the months of May-June and September-October. Fishing season for the other two commercially important species, Penaeus indicus and Metapenaeus monoceros lasts from December to February and November-December each year respectively.

Seasonal Variations

The catch of prawns, both of penaeid and non-penaeid varieties, is subject to great seasonal variation. The landings of penaeid prawns in India vary between 12.7 per cent and 35.8 per cent depending on the season, while those of non-penaeid prawns range from 3.4 per cent to 44.5 per cent. The highest percentage of catch of penaeid prawns is during the quarter July to September and that of non-penaeid prawns during the quarters April.

Alongwith the variation in the availability of various species of shrimp and prawns during different seasons, the occurrence of individual species also varies to a great extent. Although data in relation to the landings of individual species of shrimp are not available,

a rough estimation of the occurrence of shrimp in India is as as follows:

Relative Occurrence of Shrimp in India[1/]

(in Percentages)

30-40	10-20	5-10	1-5	Below 1
Metapenaeus dobsoni	i) Parapenaecpsis Stylifera ii) Metapenaeus affinis	i) Penaeus indicus ii) Metapenaeus monoceros	Metapenaeus brevicornis	i) Penaeus monodon ii) Parapenaeopsis Sculptilis iii) Parapenaeopsis hardwickii iv) Solenocera indica

Shrimp Fishing

Shrimp catch in India is mainly effected through small mechanised boats which have a limited range of operation and can operate in inshore waters only. To a small extent shrimp is also caught in drag nets, traps

1/ Source: "A Shrimp Calendar for India" by Dr. C.T. Samuel, Indian Seafood, Vol. VI, No. 4(1969).

and stake nets in backwaters and lagoons. In other countries of the world such as USA, Mexico, Japan, etc. increasing trend is towards the use of larger steel vessel which have wider range, yield larger catches, and are more durable. The modern technological developments have been increasingly employed in shrimp trawling which have considerably improved shrimp operations in these countries and in the new areas in Latin America, West Africa and Persian Gulf. As against the use of small motorised boats in India, the shrimp trawlers in maritime countries abroad are invariably equipped with fish finders, radio telephones, radar, mechanical refrigeration and insulated refrigerated fish holds according to sizes. Compared to these developments in the competing countries, much needs to be done in India, as discussed in the appropriate section of this Report, to increase the fish production and to further exploit the shrimp resources of the country, by the introduction of well equipped larger shrimp trawlers at international prices with proper facilities for their operation.

Night fishing for shrimp is a new characteristic feature in the leading maritime countries of the world, particularly in USA, Japan and Mexico where this method

has yielded strikingly increased catches. In India night fishing for shrimp has yet to be tried.

Landings

The large size shrimp is fished from the South Atlantic, North East Atlantic, Gulf of Mexico, the Caribbean Sea, Persian Gulf, Arabian Sea, Bay of Bengal, Australian Coastline and the Coast of West Africa.

The average annual world landings of shrimp during 1961-68 were of the order of 658,000 tonnes. To this, India contributed about 13 per cent, the average annual shrimp landings during the same period being 85,300 tonnes. Next only to the United States, India is the second largest producer of shrimp in the world. Thailand, Mexico, Japan and Malaysia are the other major producers of shrimp. Table A-I indicates the shrimp landings of leading countries from 1961 to 1968.

Table A-1

Shrimp Landings in Major Countries[2/]

(Thousand tonnes)

Country	1961	1963	1964	1965	1966	1967	1968
World Total	490.0	671.0	670.0	663.0	697.0	757.0	771.0
USA	79.1	99.4	96.1	110.0	108.4	139.6	132.3
India	62.8	81.6	94.9	77.3	90.9	91.6	99.8
Thailand	16.5	10.3	29.5	35.2	45.3	61.7	75.0
Japan	73.5	86.7	77.8	66.5	68.8	61.0	66.3
Mexico	72.3	72.0	69.0	59.1	65.8	70.1	58.6
Malaysia	16.1	19.0	193.3	20.8	24.4	32.3	32.9

Trends in Landings. World landings of shrimps have shown a steadily increasing trend during the last few years, production having gone up from 490,000 tonnes in 1961 to 771,000 tonnes in 1968, or at an average annual growth rate of 6.7 per cent. The countries occupying first three positions in relation to shrimp production, namely USA, India and Thailand have also increased their production during the same period. Their increased production has, however, been punctuated by occasional decline during the

intervening years. These fluctuations are ascribed to the seasonal nature of the shrimp fishery. Thailand and Malaysia are the two countries which have recorded phenomenal increases in production year after year during 1961-68 period. Thailand which today ranks third in world shrimp production has attained nearly five-fold increase, its landings having mounted to 75,000 tonnes in 1968 from only 16,500 tonnes in 1961. Malaysia's production has gone up to 32,300 tonnes from 9,000 tonnes during the same period. Australia is another country which has come up on the world map of shrimp, its landings having risen from 2,000 tonnes in 1958 to over 9,000 tonnes in 1968. It is one of those few countries which have increased their production by entering into collaboration agreements with foreign companies, especially of Japan and USA for accelerating the pace of development of their fishery industry. Against this background, Table A-2 indicates India's position in relation to world landings of shrimp during the period 1961-68.

Table A-2

World Landings of Shrimps
vis-a-vis India

(Thousand tonnes)

Year	World	India
1961	490.0	62.8
1962	548.0	83.2
1963	671.0	81.6
1964	670.0	94.6
1965	663.0	77.3
1966	697.0	90.9
1967	757.0	91.6
1968	771.0	99.8

As can be seen from the above, while the world landings of shrimp during the last decade have almost been progressively mounting, there have been considerable variations in the shrimp landings of India. The shrimp catch was 86,700 tonnes in 1958 which after touching the lowest level of 62,800 tonnes in 1961 rose to 94,900 tonnes in 1964. Once again, after experiencing a decline during the subsequent three years, the shrimp catch in India has touched a new high in 1968 with a record catch of 99,800 tonnes representing about 13 per cent of the total world shrimp landings.

3/ Source: FAO Yearbook of Fishery Statistics, 1968.

Shrimp Landings in Maritime States of India. Shrimp in India are found mainly in the fishing grounds off Maharashtra, Gujarat, Kerala and Mysore on the west coast and Tamil Nadu and Andhra Pradesh on the east coast. These are supplemented by the fisheries in back-waters and brackish water lakes of Kerala, Tamil Nadu, Andhra Pradesh and Orissa as well as the estuaries of the Godavari, the Mahanadi and Sunderbans. About 70 per cent of the total shrimp landings in India comprise the penaeid group.

Kerala, Tamil Nadu, Maharashtra, Andhra Pradesh and Orissa are the principal prawn producing States in India. The availability of prawns in the various maritime States as also their distribution into penaeid and non-penaeid groups is extremely uneven, as can be seen from Table A-3 on page 11.

Table A-3

Statewise Distribution of Prawn Landings 4/

(in tonnes)

	1965	1966	1967	1968	Percentage to total of 1968
Kerala	12,503	20,284	25,038	25,391	25.2
Penaeids	12,419	20,099	24,950	25,356	
Non-Penaeids	84	259	88	35	
Mysore	399	584	371	5,426	5.4
Penaeids	399	584	371	5,425	
Non-Penaeids	-	-	-	1	
Maharashtra	50,199	43,145	36,264	41,607	41.4
Penaeids	9,787	9,833	7,888	11,296	
Non-Penaeids	40,412	33,312	28,376	30,311	
West Bengal and Orissa	2,133	1,887	7,745	10,919	3.6
Penaeids	2,133	1,885	7,738	10,919	
Non-Penaeids	-	-	-	-	
Andhra Pradesh	3,833	3,618	8,884	6,126	6.1
Penaeids	3,503	2,992	6,882	5,784	
Non-Penaeids	330	626	2,002	342	
Tamil Nadu (including Pondicherry)	2,714	6,257	7,156	7,482	7.4
Penaeids	2,632	6,134	7,005	46,748	
Non-Penaeids	82	123	151	734	
Grand Total	76,232	80,318	87,551	100,671	100.0
Penaeids	34,817	45,550	58,487	68,749	
Non-Penaeids	41,415	34,768	29,064	31,922	

4/ Source: Central Marine Fisheries Research Institute, Mandapam Camp.

While the prawn catch in Maharashtra is the highest at 41,607 tonnes in 1968 about 64 per cent of it belongs to the non-penaeid group which, being very small in size, is used only for drying. Kerala on the other hand, with 25,391 tonnes of prawns, ranks first on account of the largest availability of penaeid variety amounting to 25,356 tonnes, which are commercially important and most suitable for freezing. Tamil Nadu and Andhra Pradesh contribute about 7,000 tonnes and 6,000 tonnes respectively to the total penaeid prawn landings in the country. West Bengal and Orissa together land about 11,000 tonnes. Exploratory surveys and investigations have shown the availability of quality shrimp in large quantities off Saurashtra, Ratnagiri, Mangalore, Kerala, Gulf of Mannar, Coromandel coast and the Western half of the Bay of Bengal.

Of late, there has been a feeling in the fishing industry that the size of prawns landed in south west coast has shown a gradual decline. This phenomenon is ascribed by trade to various causes such as over-exploitation and depletion of prawn resources. There has, no doubt, been a small decline in the sizes of prawns caught during the last four years, as can be seen from

the following table which indicates the mean size of prawns landed in Cochin area during the last four years, The mean size of Penaeus indicus species has declined from 157.5 mm in 1964-65 to 139.4 mm in 1967-68. Over the same period the size of another species of prawn, M. Monoceros has gone down from 118.2 mm to 92.5 mm.

Table A-4

Mean Size of Prawns Landed by Mechanised Fishing Boats at Cochin 5/

(in mm)

	1964-65	1965-66	1966-67	1967-68
Penaeus indicus	157.5	155.9	143.9	139.4
Metapenaeus dobsoni	89.7	92.5	80.05	84.8
M. affinis	118.7	108.6	104.5	118.1
M. monoceros	118.7	101.3	92.8	92.5
Parapenaeopsis Stylifera	86.5	84.4	86.6	95.7

Discussions held with experts in the field revealed that this decline in mean size is due to (a) expansion of fishing activity in the in-shore water of the west coast,

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5/ Central Marine Fisherics Research Institute, Mandapam Camp.

especially the fishing grounds off Cochin and Quilon and (b) shifting of fishing grounds from 21-m, depth to 17-m depth. Added to these factors, the size of prawns is normally small when they are captured near backwaters immediately after the spawing seasons. One of the experts on marine biology, ascribing the cause of decline in size of prawns to natural phenomenon, has expressed* that there is scope for increasing the annual landings of penaeid prawns to the level of 100,000 tonnes with the existing fleet of mechanised vessels provided the fishing activity is extended beyond 20 fathoms. Therefore, while there is no apprehension of depletion of prawn fishery resources, the decline in sizes has caused some concern to the processing industry because the reduction in size affects the price realisation in the overseas markets. In order to check the declining trend in the size of prawns, it will be necessary to take the following measures:

1. The number of fishing vessels in the inshore waters, where the fishing activity has increased beyond the desired magnitude, will have to be restricted.

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* "The Prawn Fishery Resources of India", Paper presented by Dr. S. Jones at the FAO World Scientific Conference on the Biology Culture of Shrimps and Prawns, 1967.

2. Mechanised vessels capable of fishing in off-shore waters will have to be encouraged to undertake fishing beyond 20 metres depth.

The investigations and studies carried out by the Central Institute of Fisheries Technology in 1968 have brought out that the catches of prawns are related to the fishing grounds and the size of vessels. For instance in 1968, in Cochin, of the total catch of a 30 footer boat about 41.5 per cent constituted shrimp alone. The corresponding figures for a 36 footer boat in the same area at the same time were 44 per cent. Off Veraval coast shrimp constituted 42 per cent of the total catches of a 50 foot boat, while the 36 foot boat landed only 21 per cent of prawns. The same feature is brought out by the fishing experiments in Goa and Kakinada as shown in the following table.

Table A-5 : Percentage of Shrimp Catch in total fish catches in India

Place	Boat	Percentage of prawns
Kakinada	12 M OAL (40 ft. OAL)	41.6
Kakinada	10.8 M OAL (36 ft. OAL)	32.0
Veraval	10.8 M OAL (36 ft.)	21.0
Veraval	15 M OAL (50 ft.)	42.0
Goa	9 M OAL (30 ft.)	9.0
Goa	10.8 M OAL (36 ft.)	20.0
Cochin	9 M OAL (30 ft.)	41.6
Cochin	10.8 M OAL (36 ft.)	40.0

3. With a view to helping the growth of prawns a regulation should be prescribed to enforce the spawning period as a close season for fishing. Such a regulation is already in force in Mexico and Kuwait where fishing for shrimp is not allowed during certain period of the year. As a first step towards the enforcement of such a regulation, detailed information should be collected in regard to all aspects which have a bearing on this problem.

4. An important factor relating to life history of penaeid prawns is that they spend a part of their early life in the backwaters and/or brackish water lagoons. Of late there has been a tendency to reclaim backwaters mainly for agricultural purposes, particularly in Kerala. This is causing an apprehension in the minds of fishery biologists who feel that such large scale reclamation of brackish waters will adversely affect the future of marine prawn fisheries. It is, therefore, necessary to formulate suitable management policies to protect brackish water resources. Certain measures have been taken in Mexico and Venezuela where adequate provision has been made for connecting brackish water areas with sea months. These countries have developed brackish waters for regulating prawn fishery wherefrom it is captured with certain types of gear. In India also it may be desirable to undertake investigations to study the effect of reclamation of brackish waters on fishery resources and take necessary conservation measures.

Shrimp Processing Industry in India

The shrimp processing industry in India comprises 48 freezing units and 42 canning units. Their annual rated capacity on two shift basis is about 59,000 tonnes

and 11,442 tonnes respectively. The industry is mainly concentrated in Kerala on the west coast at Cochin, Alleppey and Quilon. Of the total processing units in the country, Kerala alone has as many as 34 freezing units and 31 canning plants, with annual production capacity of 49,400 tonnes and 9,700 tonnes respectively. The remaining, 14 freezing and 11 canning, plants are located in the other maritime States mainly, Maharashtra, Tamil Nadu, Mysore, Orissa and Goa.

Large varieties of shrimp with shell-on are generally frozen while the smaller ones are used for canning. The processing industry depends on three sources for its raw material supplies: (a) own boats, (b) direct purchases from landing centres, and (c) peeling sheds. While the first two sources supply raw material in the whole form, meat ready for processing supplied by peeling sheds forms a substantial proportion. Yield of meat from different varieties of prawns varies from process to process. The percentage yield of meat in various forms such as headless (HL) and peeled and deveined (P&D) from prawns of different species is as follows:

Headless	Percentage yield of meat	
	Penaeus indicus	Metapenaeus affinis
On Beheading	67	65
After freezing	62	60

Peeled & Deveined

	Penaeus indicus	Metapenaeus affinis	Metapenaeus dobsoni	Parapenaeopsis Stylifera
On peeling	50	46	44	40
After freezing	44	40	37	32
After Cooking & freezing	36	30	25	20

Grading

The material after dressing is graded for packing into 5 lb. cartons or trays in the form of (i) Headless (HL) fresh frozen, (ii) peeled & Deveined (P&L) fresh and (iii) Cooked Peeled (CP) and Cooked, Peeled & Deveined (CPD) frozen. The freezing process is done by contact plate freezers.

The grading of shrimp is done by hand and the classification of the various grades runs into a large number. The grades for the headless shrimp vary between 'under 10' per lb. to '60-70' per lb. and for peeled and deveined the variation is between 'under 15' and '130 up'. In between, there are other grades, accepted classification for which is given overleaf.

Classification of Grades*

Headless	Peeled & Deveined
Under 16	Under 15
Under 15	16 - 20
16 - 20	21 - 25
21 - 25	26 - 30
26 - 30	31 - 35
31 - 35	36 - 40
36 - 40	41 - 50
41 - 50	51 - 60
51 - 60	61 - 70
	71 - 91
	91 - 110
	111 - 130
	130 - up

From October 1969, the grade '130 up' for peeled and deveined has been further sub-divided into three grades '130-250' '250-500' and '500-up'.

The canned shrimp is classified into 'supreme jumbo', 'jumbo', 'large', medium', 'small', 'tiny', 'cooktail/mini/salted' and 'broken'. The number of counts per 100 g. for various grades of canned shrimp

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* Shrimps per pound

varies from 'upto 8' to '103 and above', as shown below:

	Count/100 g
Supreme Jumbo	8
Jumbo	9 - 13
Large	14 - 22
Medium	23 - 36
Small	37 - 63
Tiny	64 - 102
Cocktail/mini/salad	103 and above
Broken	Any pack showing more than 10% broken pieces by weight.

Compulsory grading according to the above classification has been introduced from March 11, 1969. Prior to that the lowest grade used to be Tiny with count 85 up/142 grams'. Upper limit of count has not been specified as a result of which the processors pack counts upto 300 and 400 in the size grade 'cocktail/mini/salad'. The four types of internally lacquered tinned cans used for packing prawns are 301 x 309 (one lb. jam cans), 301 x 206 (8 oz. fluid cans), 301 x 109 (5.5 oz. fluid cans) and 401 x 411 (2½ oz. cans). The most widely used can in India is of the size 301 x 206 whereas the popular and the internationally accepted size for export market is 307 x 113.

In India grading is done by manual process which is time consuming besides being quite non-uniform and inaccurate. In the other countries this process is done with the help of automatic grading machine which has also the advantage of being more hygienic. The automatic grading machines can be introduced with advantage in the shrimp processing industry in India.

There are no grades for the dried prawns. Metapenaeus dobsoni and Parapenaeopais stylifera are the two species of prawns which are used for sun drying. These varieties mainly occur in Maharashtra.

Diversification of Product

Of the total frozen shrimp production in the country, headless (with shell on) constitutes about 30 per cent and peeled and deveined fresh frozen in smaller sizes (111-130 and 130 up) forms about 55 per cent. The production of the individually quick frozen (IQF) shrimp, which has achieved strikingly successful results in other countries, is not yet undertaken on a large scale in India. Its contribution to the total production of frozen shrimp forms only about 1 per cent. In view of the increasing demand of IQF prawns in the international market, and

the better unit value realisation compared to similar counts of frozen prawns in block form, there is need for the Indian Shrimp Industry to diversify its production with progressive shift towards IQF varieties.

On an average about 50 per cent of the total weight of prawns and shrimp utilised for freezing and canning goes as waste in the form of head and shells. Only a negligible quantity of this waste is at present utilised in the preparation of manure and the rest is all thrown into the backwaters. Recent experiments have indicated that the shell yields about 30 per cent protein and the head portion yields 2.4 per cent of oil content. The prawn shell, mixed with sardine meal in suitable proportion, can produce a balanced poultry feed, the international market for which is fast expanding. Alternatively, the waste can be utilised for preparing fishmeal. The difficulty pointed out by the industry is that it is uneconomical to collect the shrimp and prawn waste in the form of shell and head from various units which are located at a distance from one another. However this would be feasible in a place like Cochin where the shrimp processing industry is concentrated and where the collection of shrimp waste can be comparatively easy and economical.

Shrimp extract, breaded shrimp and prawn paste are some of the other items which can be considered for diversified production in India. These new products have been dealt with in detail elsewhere in this Report.

Exports

Composition. World trade of shrimp takes place in frozen, canned and dried forms. The volume of trade increased from 54,000 tonnes in 1961 to 74,249 tonnes in 1968, or rose at an average annual growth rate of 4.7 per cent. In 1965 the world trade reached a peak figure of 79,800 tonnes and recorded about 48 per cent increase over 1961. Mexico, India, USA, Japan and Hong Kong are the principal shrimp exporting countries. Next only to Mexico which contributes 34.2 per cent share in the world trade, India ranks as the second major exporting country with 24.2 per cent contribution as can be seen from Table A-6.

Table A-6

World Exports of Shrimp[7/]

(Thousand tonnes)

Country	1961	1963	1964	1965	1966	1967	1968	% of World export (1968)
Mexico	36.4	34.6	32.1	27.0	29.9	32.2	25.4	34.3
India	6.7	8.0	9.9	9.8	11.4	15.0	18.0	24.2
USA	2.2	5.7	5.3	5.1	4.2	6.1	5.5	7.4
Japan	1.5	3.2	3.2	2.9	3.2	1.6	2.3	3.1
Hong Kong	2.0	4.3	3.9	4.7	5.5	4.2	4.6	6.2
Other countries	5.2	13.8	16.4	30.4	17.5	14.7	18.4	24.8
Total	54.0	69.6	70.8	79.9	71.7	73.8	74.2	100.0

Corresponding to the increase of world exports of shrimp by 37.4 per cent during 1961-68, exports of this item from India in frozen, canned and dried forms together, experienced a rise of 168.6 per cent. Exports of shrimp from India rose to a new high of 18,000 tonnes valued at Rs 189.7 million in 1968. In terms of item-wise exports, frozen shrimp occupied the top place with an export of

7/ Source: Yearbook of Fishery Statistics, 1967, FAO.

about 14,400 tonnes in 1968 realising Rs 156.3 million worth of foreign exchange. Next to frozen shrimp export of canned prawns with a little over 2,200 tonnes, earning Rs 26.1 million took the second place followed by dried prawns with an export of over 1,400 tonnes valued at Rs 7.2 million. Of the total exports of marine products from India in 1968, export of shrimp in terms of value constituted 85.9 per cent. Of this 85.9 per cent, shrimp in frozen, canned and dried forms has contributed 70.8 per cent, 11.8 per cent and 3.3 per cent respectively as can be seen from Table A-7.

Direction and Trend of Exports. The major markets for frozen prawns and shrimp in the world are USA, Japan, Australia and the EEC countries. Prawns and shrimp in air-tight containers are imported in bulk by USA, UK, the EEC countries, Scandinavian countries and the countries in the Far East. Export of dried prawns and shrimp is mostly confined to Far East and Near Eastern countries notably Hong Kong, Ceylon and Singapore. USA and UK also import small quantities of dried prawns.

India's exports of frozen shrimp have risen from 4,671 tonnes valued at Rs 15 million in 1960 to 14,397 tonnes valued at Rs 156.3 million in 1968. In fact

Table A-7

Share of Different Types of Processed Shrimps in Marine Products Exports from India 8/ (1960-68)

Qty: in Tonnes
Val: Rs '000

Year		Frozen shrimps	Canned shrimps	Dried shrimps	Total shrimps exports	Total exports of marine products
1960	Q:	4,671*(28.6)	320 (20)	-	4,991 (30.6)	16,337
	V:	14,804*(36.8)	1,784 (4.4)	-	16,588 (41.2)	40,216
1961	Q:	6,173*(35.7)	622 (3.6)	-	6,795 (39.3)	17,297
	V:	20,075*(48.6)	4,223 (10.2)	-	24,298 (58.8)	41,318
1962	Q:	2,238 (19.3)	970 (8.3)	3,068 (26.4)	6,276 (54.0)	11,619
	V:	10,820 (28.9)	6,559 (17.5)	8,944 (23.8)	26,323 (70.2)	37,475
1963	Q:	3,967 (22.1)	1,231 (6.9)	2,809 (15.7)	8,007 (44.7)	17,908
	V:	21,204 (36.2)	7,576 (12.9)	9,325 (15.9)	38,105 (65.0)	58,646
1964	Q:	5,870 (27.4)	1,074 (5.0)	3,009 (14.0)	9,953 (46.4)	21,458
	V:	31,518 (46.0)	6,989 (10.2)	8,997 (13.1)	47,504 (69.3)	68,489
1965	Q:	7,028 (45.5)	1,148 (7.4)	1,702 (11.0)	9,878 (63.9)	15,458
	V:	41,422 (59.8)	9,506 (13.7)	5,447 (7.9)	56,375 (81.4)	69,237

Contd..

Table A-7 (Contd.)

Year		Frozen shrimps	Canned shrimps	Dried shrimps	Total shrimps exports	Total exports of marine products
1966	Q:	8,784 (45.8)	1,523 (8.0)	1,163 (6.1)	11,470 (59.9)	19,153
	V:	88,792 (65.6)	18,657 (13.8)	5,271 (3.9)	112,720 (83.3)	135,246
1967	Q:	11,173 (51.3)	2,200 (10.1)	1,540 (7.1)	14,913 (68.5)	21,764
	V:	129,808 (65.1)	31,243 (15.7)	8,961 (4.5)	170,012 (85.3)	199,286
1968	Q:	14,397 (58.0)	2,238 (9.0)	1,411 (5.7)	18,046 (72.7)	24,810
	V:	156,340 (70.8)	26,156 (11.8)	7,259 (3.3)	189,755 (85.9)	220,846

Note: Figures in brackets represent the percentage over the total exports of Marine products.

Source: Marine Products Export Promotion Council, Ernakulam.

in terms of value, the contribution of frozen shrimp rose from about 37 per cent of the total marine products exports in 1960 to about 71 per cent in 1968. The major markets for Indian frozen prawns are the USA, Japan and Australia. Although small quantities of this item are shipped to a number of other countries in Europe and Far East, their contribution to India's foreign exchange earnings has not been significant. Of Rs 156.3 million worth of foreign exchange earned by frozen prawns in 1968 the USA, Japan and Australia contributed Rs 100.6 million, Rs 49.3 million and Rs 5.2 million respectively. In Europe, France is an important market for the frozen shrimp.

In keeping pace with the growing trend in exports of frozen shrimp, shrimp and prawns in air-tight containers also fared well in the overseas markets. From a meagre 320 tonnes of canned shrimp, valued at Rs 2 million in 1960 India's exports of this item rose to 2,238 tonnes valued at over Rs 26 million in 1968 contributing 11.8 per cent to the total marine products exports in that year. The principal markets for Indian canned prawns and shrimp are the USA, UK, France, Australia and the EEC countries. In 1967, India's exports of 2,200 tonnes of canned prawns earned foreign exchange worth Rs 31.2 million.

The share of USA towards this record figure has been Rs 9.3 million followed by UK, France and Australia importing worth Rs 8.6 million, 7 million and 1.2 million respectively. During 1968, while the exports of canned shrimp to USA, UK and France at over Rs 10 million, 7.9 million and 3.5 million respectively have risen over the previous year, exports to Australia have declined to Rs 0.5 million.

Although the dried fish industry has been showing a declining trend in its export performance, the fall in the dried shrimp export is not substantial. In 1962 India exported 3,068 tonnes of dried shrimp valued at Rs 9 million. The figure has since come down to about 1,411 tonnes valued at Rs 7.2 million in 1968. The contribution from this item to the total marine products export is indeed negligible, a bare 3.3 per cent. As stated earlier, India's market for this item is confined to a large extent to Far Eastern countries although the importing countries purchase regularly small quantities of this item. In 1967, after showing a precipitous fall in the previous year, exports of dried shrimp stood at 1540 tonnes valued at Rs 8.9 million. Of this, Hong Kong alone purchased 890 tonnes for Rs 4.7 million, followed by

USA and.Ceylon which imported this product worth Rs 0.7 and Rs 0.5 million respectively during the same period. In 1968 exports of dried prawns and shrimp to Hong Kong were of the order of Rs 4.8 million. While imports in USA were only worth Rs 0.15 million, Ceylon and Singapore imported this product worth Rs 0.56 million and Rs 0.32 million respectively.

Price Realisation in the U.S. Market

The average price realisation per lb. of peeled & deveined frozen shrimp from India in the principal market, namely USA, has shown an increase of approximately 13 to 30 cents for size grades ranging between 16-20 and 36-40 during 1966-68, whereas the price of smaller grades has shown a downward trend during this period, the decline being of the order of 16 to 18 cents per lb. for size grades 91-110, 111-130 and 130 up. More than 40 per cent of the total shrimp exports from India being constituted by smaller varieties belonging to the grades 91-110, 111-130 and 130 up, the downward trend of prices for smaller varieties has affected the unit value realisation. The prices of headless frozen shrimp have also witnessed an upward trend upto the size grades 26-30, while the

smaller grades have shown a slight fall as can be evidenced from the table A-8.

Table A-8

Average Wholesale Prices of Indian Shrimp in U.S. Market 9/

(in cents per lb)

Peeled & Deveined	1966	1967	1968
Under 15	-	143.3	160.8
16 - 20	122.9	138.3	152.1
21 - 25	118.0	130.8	142.9
26 - 30	112.3	125.1	138.0
31 - 35	107.6	117.8	121.6
36 - 40	103.6	111.7	116.5
41 - 50	100.1	103.2	100.6
51 - 60	95.7	97.7	92.2
61 - 70	91.1	89.6	81.0
71 - 90	86.2	78.2	69.6
91 - 110	82.9	64.8	64.9
111 - 130	77.4	59.4	59.0
130 - up	66.6	47.5	50.6
Headless			
Under 10	-	-	180.6
Under 15	119.6	130.3	156.8
16 - 20	114.8	125.1	142.8
21 - 25	109.6	111.9	128.2

(Contd.)

9/ Source: Compiled from "Green Sheets" Statements.

26 - 30	102.5	101.0	111.4
31 - 35	92.9	85.8	93.1
36 - 40	88.5	79.8	84.0
41 - 50	81.4	73.1	75.1
51 - 60	73.5	62.1	64.8
61 - 70	-	46.8	53.3

Although a similar trend has been noticed in the prices realised by other exporting countries in the U.S. market, it can be observed from Table A-9 that the unit value realised by Indian shrimp has been considerably less than what is realised by comparable grades of competing countries. Mexican prawns obtained the maximum unit value followed by Panama, Ecuador, Australia and Malaysia. The difference between the prices realised by the Indian and Mexican prawns is more or less the same for almost every grade, averaging about 10 and 20 cents per lb. for headless white and headless brown varieties respectively. More or less a similar situation is faced by Venezuela, which is also getting lower price in the American market compared to Mexican Shrimp. This has been ascribed to the quality of the Venezuelan product having gone down in recent years. It is significant to note that during the initial years of development of its shrimp fishing industry, Venezuela was able to procure

equal or even better prices than the Mexican shrimp on account of excellent quality of its product. So far as size grade '130 up' for peeled & deveined frozen shrimp is concerned, India gets a lesser price compared to Panama or Ecuador although the product is better in quality than that of Thailand and Taiwan.

Table A-9

Average Price Realisation in U.S. Market[10/]
(May - September 1969)

(in cents per lb)

Headless White

Grade	Panama	India	Ecuador	Mexico	Australia	Malaysia
Under 10	187.5	--	188.1	187.0	-	-
Under 15	166.1	155.3	162.4	182.0	-	150.0
16 - 20	163.5	148.2	162.6	173.0	-	145.9
21 - 25	143.8	130.7	144.8	158.0	140.0	133.9
26 - 30	132.9	119.3	133.6	148.0	127.5	120.0
31 - 35	119.5	108.8	119.8	130.0	-	-
36 - 40	110.5	99.0	110.0	123.0	-	-
41 - 50	94.7	-	94.7	107.0	-	-
51 - 60	80.9	-	80.9	-	-	-
61 - 70	66.5	-	66.5	-	-	-

Headless Brown

Grade	Mexico	India	Brazil	Panama	Malaysia
Under 10	-	-	180.1	183.7	-
Under 12	170.2	-	-	-	-
Under 15	170.2	149.9	161.0	159.3	149.5
16 - 20	167.7	139.9	156.7	156.1	144.8
21 - 25	-	120.0	138.7	140.0	130.3
26 - 30	-	110.9	128.9	128.0	118.5
31 - 35	-	99.3	119.0	115.6	100.0
36 - 40	-	90.9	109.0	106.2	92.0
41 - 50	-	-	-	93.4	-
51 - 60	-	-	-	84.5	-

10/ Source: Compiled from "Green Sheet" Statements.

Peeled & Deveined (Blocks)

Grade	Panama	Thailand	India	Ecuador	Taiwan
16 - 20	-	-	164.9	-	-
21 - 25	-	-	156.4	-	-
26 - 30	-	-	146.7	-	-
31 - 35	-	-	131.4	-	-
36 - 40	-	128.0	123.1	-	-
41 - 50	-	-	113.1	-	-
51 - 60	-	108.0	104.7	-	-
61 - 70	-	100.0	97.6	-	-
71 - 90	-	-	85.0	-	-
91 - 110	-	-	79.9	-	-
100- 130	70.3	-	-	-	-
111 - 130	70.1	-	76.7	69.9	-
130 - Up	74.5	61.5	68.5	74.0	59.8
	-	-	59.4	-	-

Peeled & Deveined (IQF)

Group	Mexico	Brazil	Ecuador
Under 10	-	-	210.7
Under 15	221.8	212.5	205.8
16 - 20	214.6	211.0	204.4
21 - 25	200.2	185.0	174.6
26 - 30	173.2	-	161.6
31 - 35	148.9	-	145.0
36 - 40	145.5	-	130.0
41 - 50	137.1	-	115.0
51 - 60	130.1	-	-
61 - 70	-	-	-

The reasons ascribed for lower unit value realisat for Indian frozen shrimp are as follows:

(1) Block vs IQF. Bulk of the shrimps exported by India to the US market are in 5 lb blocks in green headless shell-on or peeled & deveined form. Since other countries like Mexico, Brazil, Panama, Ecuador, etc. supply their products in IQF and other ready-to-cook forms in consumer packs, they realise 15 to 20 cents more per lb in comparison to India.

(2) Defective Grading. The experience of the importers in USA indicates that the grading of Indian shrimp is generally defective. There is no uniformity in the sizes of blocks packed in the master carton, nor in the size of pieces contained in individual blocks. The blocks thawed out at times show either too small or too many pieces although the average counts remain well within the range of the product.

(3) Unattractive Packaging. The master carton used by Indian exporters is considered to be one of the poorest in the US market. The cartons do not stand the strains and stresses during transit in the refrigerated holds and they get wet and damaged by the time they reach the US ports and require repackaging at the importers end. The size of packaging employed by Indian exporter is considered to be smaller than the master cartons used by other exporting countries. The importers in USA prefer larger master cases.

(4) Defects in Quality. US importers have observed that consignments received at timescontain 5 to 10 per cent of the defective and unsalable product.

With a view to realising better unit value in the international market, it is essential for the shrimp processing industry in India to effect improvement in the quality, grading and packaging of the frozen shrimp. These measures will improve the competitiveness of the product besides meeting the requirements of the consumers in foreign markets. It is also very clear that by

switching over to production of IQF shrimp for export, Indian exporters can realise much better unit value.

Canned shrimp of late has been realising comparatively lesser value in the American as well as in other markets. However, prices quoted in Canada where Indian canned shrimp has yet to establish a regular export market offer a slightly better price as can be seen below f the price information collected by the Survey Team.

Table A-10

Import (CIF) Prices for Canned Shrimp

(in $ per master carton of 24 cans of 4½ oz.)

	Canada	USA
Broken	7.25 to 8.50	6.50
Tiny	-	7.00 - 7.50
Small	9.00	8.00 - 8.50
Medium	10.15	9.00 - 9.50
Jumbo	-	13.00

The corresponding wholesale import prices in UK and other European markets are also, like USA, on an average 50 to 100 cents less per master carton compared to the prices in the Canadian market. Therefore, if Indian producers of canned shrimp can develop the Canadian market, a better unit value can be realised.

Problems of Shrimp Industry

The present capacity utilisation in the freezing and canning sectors of the shrimp industry works out to 25 per cent and 20 per cent respectively against the capacity utilisation of processing plants in other countries like Mexico which is estimated at between 50 and 60 per cent of the installed capacity. The large unutilised capacity is due to numerous problems confronted by the industry. While all the problems relating to the industry have been discussed in greater detail in appropriate section of this Report, a brief mention of some of the important problems is made hereunder.

Shortage of raw material is the principal problem hampering the shrimp processing industry. Of the total requirements of about 150,000 tonnes of shrimp, to make full utilisation of the capacity, the industry in 1967 was able to procure only about 40,000 tonnes. The problem has become more acute in recent years with the unrestricted growth of processing units unaccompanied by adequate efforts on their part to bring about proportionate increase in shrimp landings. The phenomenon of increased demand for shrimp and its limited supply has resulted in rising prices and unhealthy competition among the

processing units and merchant exporters. The following measures are needed to overcome these problems:

(i) It is necessary to take immediate steps to increase the shrimp landings by encouraging fishing units to go in for larger trawlers for undertaking off-shore fishing with improved gear and equipment. Till such time the trawlers are made available indigenously and at international prices, it will be necessary to procure these under suitable arrangements by import, charter or under joint venture schemes.

(ii) Along with the increase in shrimp catches, it is essential to subject the industry to some sort of regulation or control for its organised development thereby ensuring that mushroom growth of the processing units is checked at least till the raw material supplies are augmented. This is important particularly in areas where there is already heavy concentration of the processing activity. The new units should, however, be established in comparatively under-developed but potential areas for bringing in balanced regional growth.

(iii) Simultaneously, it will be desirable to regulate the prices of raw materials and stabilise them around economic level.

On the processing side, the quality of export product of some of our competitors in the international market enjoys better reputation and realises better unit value on account of the fact that they observe strict

in-plant inspection from the stage of boat operation till the processing of the final product. Besides, the present processing methods employed by them are mostly mechanised whereas in India there is much scope for introduction of mechanisation and in-plant inspection at various stages of processing. The entire production being wholly export-oriented, it is necessary to bring the quality of Indian product on par with that of its competitors. In order to achieve this objective, it is necessary to progressively introduce:

(i) (a) proper handling of shrimp on board, during beheading process and use of ice or chilling at various stages;

(b) mechanisation in the processes of pneumatic unloading, grading and brine chilling;

(c) in-plant inspection at every stage of processing; and

(d) minimum standards to meet sanitary and hygienic requirements.

(ii) The industry should also take up the processing of new products, such as IQF, breaded shrimp and shrimp paste, to meet specific requirements of the processing establishments in importing countries for the manufacture of convenience food.

(iii) Efforts should also be made to improve packaging and to market directly all the overseas markets.

Organisational Development

The growth of shrimp industry in India has been uneven. This has been partly due to the fact that the industry has not been subject to any discipline, control and adequate governmental assistance. Whatever development is seen today is mainly due to the private initiative. It is necessary that for the development of the industry on proper lines and for promoting its exports there should be an organised development with Government support to provide the necessary infrastructure and assistance in various fields. With this objective in view, an all-India autonomous organisation to look after the entire range of problems of the industry from the stage of production to export marketing should be promoted. The proposed organisation may be called the Shrimp Export Development Authority and should be responsible for assisting and helping the growth of this industry and trade and the Government. Steps for establishing this organisation should be initiated by the Ministry of Foreign Trade. The main functions of this Authority should include:

(1) To undertake registration and licensing of fishing and processing units as well as export enterprises.

(2) To establish infrastructure for landing, handling, processing, distribution and marketing of shrimp and shrimp products.

(3) To increase shrimp landings by encouraging off shore and deep sea shrimp trawling and to ensure adequate supply of raw material to the processing sector.

(4) To arrange for issue of import licences for machinery equipment and other accessories required for the industry.

(5) To assist the industry in stablisation of raw material prices and in the export marketing by obtaining better unit value realisation for its products.

(6) To extend financial assistance to the shrimp industry in the form of grants and loans for procurement of fishing vessels, processing plants, and other equipment.

(7) To lay down standards for in-plant inspection and quality control.

(8) To undertake market research and sales promotion for shrimp.

(9) To arrange for advanced training of personnel in fishing, fish processing and marketing.

(10) To promote close association and cooperation amongst the industry, trade and the Government; and help the Government in the formulation of policies in relation to the shrimp industry; and

(11) To undertake such activities which will directly or indirectly improve, organise and develop the shrimp industry.

The constitution of the Shrimp Export Development Authority should be framed in such a manner that it is autonomous in character and is vested with adequate powers relating to finance; licensing and regulation; marketing and distribution; research, development and training and effective management. The existing organisations connected with the shrimp industry should also be given adequate representation on this Authority.

Prospects

The completion of the various projects* recommended by the Survey and those already planned or underway in relation to the development of basic infrastructure as also the introduction of large mechanised boats would ensure India to exploit the hitherto untapped shrimp resources in and around Indian seas, thereby broadening and strengthening its supply base for the processing and export of shrimp. On the demand side, taking into consideration the present trends in regard to the growth of population, income levels and the per capita consumption of fishery products in major market countries, more especially shrimp, there is every reason to anticipate that the international demand for seafoods particularly shrimp is bound to increase steadily in the years to come.

* See Volume I for details.

Frozen Shrimp. USA is the principal market for shrimp. Canada, Japan, Australia and the countries of Europe, especially UK, France, West Germany and Switzerland are the other important markets. Mexico, India and a few Central and South American countries are the major exporters of shrimp. US imports of shrimp in frozen, canned and dried forms have increased to about 86,000 tonnes in 1968 from 70,000 tonnes in 1964, representing a 23 per cent rise over the last five years. While as much as 83 per cent of the total shrimp production of Mexico is exported to USA, India's exports to the US market represent only 20 per cent of its total production. Again whereas Mexico meets 32 per cent of the requirements of the US imports of shrimp, India's contribution is only of the order of 12 per cent. However, largely on account of its geographical proximity, the major portion of the Mexican output is exported to the United States. The catches of shrimp in Mexico have been steadily declining during the last few years, partly due to the downward phase of the biological cycle and partly on account of the depletion of resources. Besides, the domestic consumption of fishery products in Mexico is on the increase.

Mexico may not, therefore, be in a position to meet the American demand to the extent it has been doing so hitherto. This situation can be taken advantage of by the Indian shrimp industry by increasing its share of exports to the US market.

Japan is the second largest market. for shrimp. Its imports of frozen shrimp have more than doubled during the last five years from 18,000 tonnes in 1964 to 44,000 tonnes in 1967. While Mexico, Mainland China, Thailand and India are the major exporters of shrimp to Japan, India's share in the Japanese import of shrimp is only 7.7 per cent. Frozen shrimp has become quite popular in Japan and is the most common item in Japanese restaurants. With increasing purchasing power, and the present rising trend of consumption pattern coupled with the declining domestic supply of shrimp in Japan, India has bright prospects to increase its exports in substantial quantities to the Japanese market. The estimates of future consumption indicate that at the 1967 level of per capita consumption, demand for shrimp in Japan is expected to be of the order of about 70,500 tonnes by 1975. If, however, the current upward trend in per capita consumption is also

taken into account the estimated corsumption may be as high as 85,500 tonnes by 1975. Besides, USA and Japan would also need to import some quantities of this product for other purposes.

Australia has till recently been another market for Indian frozen prawns and shrimp. China (Mainland) and Hong Kong have been the other principal exporting countries to this market. On account of the development of the shrimp fishing industry in Australia, its imports of this product have considerably declined during the last few years. Australia's imports of shrimp at over 1,000 tonnes valued at $ 1.3 million in 1965-66 have declined to only 200 tonnes valued at $ 0.15 million during 1967-68. Imports into the Australian market from India are mainly of the cooked and peeled variety of smaller sized prawns such as Metapenaeus dobsoni and India being the producer of larger quantities of this variety has great potential to increase its exports to Australia provided, the quality is maintained.

Canned Shrimp. U.S. is the main market for canned shrimp. Of over 20 countries which export canned prawns to this market, India and Mexico together constitute 92 per cent of the total U.S. imports of this product. India occupies top position as an exporter of canned shrimp to US market

with 51 per cent share. India also exports canned shrimp to U.K., France, and other European markets in sizeable quantities. Imports in all these markets have been on the increase both in volume and value except for a slight fall in 1967-68 in the case of UK and USA. However, this decline was compensated by a substantial increase in exports of this product to other European countries like West Germany, Italy and Switzerland besides New Zealand and Australia. The survey has revealed that there may not be scope for increase in exports of this product in the U.S. market as the market preference is for frozen shrimp. It may also be mentioned that a sizeable quantity of the canned shrimp imported by USA is re-exported to UK and other European countries. Markets in European countries are fast developing for canned shrimp and Indian canned shrimp has already established a name in these countries. Some of the major importers contacted in these countries during the survey have evinced interest in obtaining large consignments of quality canned shrimp from India. Australia, West Germany, Italy and Switzerland also offer scope for increased trade in this commodity especially when imports of canned shrimp in these countries have shown an upward trend during the last three years.

Dried Prawns. Hong Kong, Singapore and Ceylon are the principal buyers of Indian dried prawns. Of these three markets, exports from India to Hong Kong and Singapore have shown a substantial increase during the last few years.

They have risen from 287 tonnes in 1965-66 to about 1,200 tonnes in 1967-68 for Hong Kong. While exports to Singapore during the same period have mounted from 29 tonnes to 511 tonnes, Ceylon has indicated a declining trend. Burma, which till recently has been one of the largest consumers of Indian dried prawns has completely stopped its imports after 1965-66. On the other hand, New Zealand, France and Mozambique are emerging as the new markets for the import of this item. India can exploit and develop these potential markets for the dried shrimp trade. Simultaneously, measures should taken to improve the quality of the product to sustain and maintain its traditional markets. Taking into consideration the potential demand for shrimps in frozen, canned and dried forms, the export targets that would be realised by the end of the Fourth and Fifth Plan periods are indicated below.

Qty: Tonnes
Val: Rs million

	1968-69		1973-74		1978-79	
	Qty	Val	Qty	Val	Qty	Val
Shrimp						
Frozen	16,315	180.24	34,200	487.00	53,500	757.00
Canned	2,166	25.45	4,500	53.00	6,600	78.00
Dried	1,076	6.03	1,500	10.00	2,400	16.00
Total	19,557	211.71	40,200	550.00	62,500	851.00

It is envisaged that the exports of shrimps in frozen, canned and dried forms in terms of quality could be doubled by 1973-74 and trebled by 1978-79. On the basis of the past trend, the targets are realistic since in the past five years exports have registered a 100 per cent rise . At the same time the supply side would also be considerably strengthened with the projected additions of the vessels, implementation of the fishery projects in selected fishing harbours and provision of additional processing facilities.

Based on the past trends and the broad indications available for major markets, the survey has made market-wise projection at constant prices for frozen, canned and dried shrimp as indicated in Table A-11.

Table A-11

Export Projection for Indian Shrimp by Destination

Qty: Tonnes
Val: Rs million

	1973-74		1978-79	
	Qty	Val	Qty	Val
Frozen Shrimp/Prawn				
USA	20,520	292.00	27,500	403.00
Japan	10,260	147.00	16,000	235.00
Australia	684	10.00	1,000	15.00
UK, Germany, West, France, Switzerland, Canada	2,736	38.00	5,500	80.00
Total	34,200	487.00	50,000	733.00

Table A-11 (Contd.)

	1973-74 Qty	1973-74 Val	1978-79 Qty	1978-79 Val
Canned Shrimp				
USA	1,350	15.90	1,800	23.40
UK	1,580	18.55	2,100	27.30
France	670	7.90	720	9.35
Canada	230	2.70	480	6.30
West Germany	180	2.10	240	3.00
Switzerland	130	1.55	180	2.35
Italy, Netherlands, Denmark, Belgium, Sweden	360	4.30	480	6.30
Total	4,500	53.00	6,000	78.00
Dried Prawn				
Hong Kong	750	5.00	1,200	8.00
Singapore	225	1.50	360	2.40
UK	225	1.50	360	2.40
Hawaii	45	0.30	72	0.48
Netherlands	45	0.30	72	0.48
Ceylon, Mozambique, France, New Zealand	210	1.40	336	2.24
Total	1,500	10.00	2,400	16.00

1.2 Sardines

Background

Sardines occur mainly in the Indo-Pacific and Atlantic Oceans. They are caught in abundant quantities off the coasts of Peru, Japan, India, Morocco and Portugal. World sardines landing in 1968 amounted to 13.5 million tonnes as against the world fish landings of 64.0 million tonnes, thereby constituting 21 per cent of the total fish landings.

Species. Sardines occur in a variety of species. Of the important species found in the seas around India, oil sardine, Sardinella longiceps, is the most important and abundant. The fishing of this species is limited to the coastal belt of about eight to twelve kms between Goa and Quilon. The fishing season for the oil sardine commences immediately after the South west monsoon and lasts from August to March with a peak season from September to December. Among other varieties of sardines mention may be made of the Sardinella albella, Kowala coval, Sardinella gibbosa, and Sardinella perforata. The first two predominate on the west coast of India and the latter two on the east coast.

Sardine Fishing. Sardines are more easily caught during night as they give off a phosphorescent light, which makes it easy to detect them. Many methods have been used in catching sardines beginning with the brush weirs. Which consists of a stationary fish trap which blocks the course of the fish and funnels them into an enclosure. The purse seine is a more up-to-date method by which it is possible to fish in deeper waters. The purse seine is circled around the school of fish and the bottom is closed keeping the fish trapped. The third method i.e. the air-bubble hose method consists of a hose pierced with holes along the upper surface and stretched along the ocean bottom around an area containing sardines. Compressed air pumped through the hose causes bubbles to rise to the surface and, since the small fish cannot swim through the wall of bubbles they are trapped. In some countries mid-water trawls are practised in certain areas for catching sardines.

Sardines are caught in India mainly by large shore seines, boat seines, drift nets and gill nets. The Indo-Norwegian Project has experimented with the purse-seines for the oil sardines and this method has proved effective not only for oil sardines but also for other pelagic fisheries.

Landings

Landings of sardines by major countries during 1961-68 are shown in Table B-1 on page 53.

Trends in Landings. The world catch of sardines has increased considerably during recent years. It has reached 13.5 million tonnes in 1968 as compared to 7.7 million tonnes in 1961, the average annual growth rate being 8.4 per cent. Peru accounted for 75.5 per cent of the world catch of sardines (Anchovieta). Its landings have improved by 51.1 per cent between 1961 and 1968 having risen from 5,014,000 tonnes in 1961 to 10,264,500 tonnes in 1968. This increase in landings was, however, punctuated by serveral up and down swings during the intervening years mainly due to the seasonal nature of the fishery.

Japan, India, Spain, Morocco, South Africa and Namibia constitute other major producing countries accounting for about 19 per cent of the total landings.

Sardines contributed the largest share (33.4 per cent) in India's total marine fish landings in 1968. Its landings of sardines have evinced a significant rise from 187,648 tonnes in 1961 to 301,400 tonnes in 1968, or at an average annual growth rate of 7.0 per cent.

Table B-1

Landing of Sardines by Major Countries[1/]

(in Thousand tonnes)

Country	1961	1963	1964	1965	1966	1967	1968	% of the total in 1968
Peru	5,014.0	6,637.0	8,873.6	7,249.8	8,531.7	9,826.7	10,264.5	75.5
Morocco	125.5	128.8	141.7	162.8	252.8	210.0	170.3	1.3
Portugal	149.3	123.2	169.3	145.6	129.5	118.6	-	-
Japan	494.0	376.5	312.1	415.1	421.2	382.0	382.0	2.8
Namibia	342.3	546.7	656.6	666.6	634.7	707.4	808.3	7.1
India	188.0	63.6	274.3	262.0	252.8	259.1	301.4	3.2
Spain	258.9	79.6	109.9	132.3	94.4	88.9	71.9	0.5
South Africa	402.4	400.9	256.1	204.1	114.2	299.2	675.0	4.9
Total incl. others	7,700.0	8,684.0	11,622.0	9,728.0	11,766.0	12,870.0	13,581.0	100.0

Source: 1/ : Yearbook of Fishery Statistics, FAO, 1968.

Landings in Maritime States of India. Sardines are found mainly in the states of Kerala, Mysore and Maharashtra on the west coast and Tamil Nadu, Andhra Pradesh, West Bengal and Orissa on the east coast. It can be noticed from the table below that about 90 per cent of the landings take place in Kerala and Mysore-Mangalore, Calicut, Cannanore, Cochin, Alleppey and Quilon being the principal landing centres. The annual landings of sardines since 1961 in the various maritime states are shown in Table B-2.

Table B-2

Statewise Landings of Sardines 2/

(in tonnes)

	1961	1965	1966	1967	1968
Andhra Pradesh	5,891	9,512	31,327	9,019	8,907
Gujarat	11	18	6	51	41
Kerala	171,218	237,999	211,455	244,446	254,771
Maharashtra	726	1,147	997	1,262	1,349
Mysore	1,710	39,804	45,364	20,854	54,972
Tamil Nadu	6,347	10,257	18,960	11,560	13,269
West Bengal	1,727	2,084	3,140	1,297	3,079
Total	187,648	304,633	311,857	293,587	345,091

2/ Source: Central Marine Fisheries Research Institute, Mandapam Camp.

Kerala with its landings of 254,771 tonnes, accounting for 73.8 per cent of the total landings, ranks first among all the states harvesting sardines. Its landings reflected a rise of 48.7 per cent during 1961-68, having increased from 171,218 tonnes to 254,771 tonnes. Next to Kerala, Mysore ranks second in India's production of sardines. It contributes about 16 per cent to the total landings. Its landings have risen from 1,710 tonnes in 1961 to 54,972 tonnes in 1968.

Processing

Although sardine is the most important fishery in terms of volume of catch in India, very little effort has been made towards processing of this fish. There are at present only six canners in India engaged in packing sardines . Three are located in Cochin, one is in Calicut, another is in Malpe and the sixth one is in Bombay.

Canning of sardines involves immersion of the fish in 15% brine, and then packing them in clean lacquered cans. The cans are kept upside down on perforated trays for cooking at 5 lb steam pressure. The steamed material is dried at 70°C in an artificial dryer. The cans are then filled with refined groundnut oil, heated at 85°C

and sealed immediately before cooling and retorted for an hour at 15 lb steam pressure. Immediately after processing, the cans are cooled in flowing water.

Cost of Production

The cost estimates for production of sardines in various types of cans are indicated below:

(i) When packed in 301 x 309 cans (per case of 48 cans)

Cost of raw material	Rs 15.00
Cost of oil	Rs 18.00
Labour & processing charges	Rs 15.00
Cost of can	Rs 14.00
Labelling charges including label	Rs 1.50
Cost of wooden case	Rs 2.00
Total	Rs 65.50

(ii) When packed in 301 x 206 (per case of 48 cans)

Cost of raw-material	Rs 10.00
Cost of oil	Rs 13.00
Labour & processing charges	Rs 10.00
Cost of can	Rs 12.00
Label charges	Rs 1.50
Cost of wooden box	Rs 1.80
Total	Rs 48.30

(iii) When packed in Quarter dingley cans (per case of 100 cans)

Cost of raw material	Rs 15.00
Cost of vegetable oil	Rs 17.00
Labour & processing charges	Rs 13.00
Label and packing charges	Rs 8.00
Cost of cans	Rs 22.00
Cost of wooden case	Rs 2.00
Total	Rs 77.00

Exports

Composition and Trend. Sardines occupy a prominent place in the international trade of fishery commodities with an export of over 2.1 million tonnes in 1967, 128,000 tonnes in canned form and about 2 million tonnes as fish meal. About 15.7 per cent of the world sardines landing entered the export trade constituting 27.4 per cent of the world fish trade.

In addition to the exports of canned sardines, small quantities of frozen and dried sardines also enter the export trade, though statistics in this regard are not available. It is reported that Morocco exports frozen sardines to France while Portugal and Algeria export dried sardines to Cyprus and France.

Export of canned sardines is virtually the monopoly of Portugal, though of late, Morocco and South Africa have also emerged as important exporters. There are several other countries which export this product but the quantities involved are negligible. World exports of canned sardines are shown in the following table:

Table B-3

Exports of Canned Sardines 3/

Qty: Thousand tonnes
Val: Thousand US dollars

Country		1961	1963	1964	1965	1966	1967	% of Total in 1967
World Exports	Q	182	123	141	126	146	142	100.0
	V	84,500	63,902	76,372	72,063	86,592	78,888	
Morocco	Q	32	30	42	22	37	35	24.6
	V	17,968	16,598	22,532	12,427	21,025	19,983	
South Africa	Q	67	23	29	25	29	33	23.2
	V	21,480	7,445	9,124	7,834	9,125	9,388	
Japan	Q	6	5	0.6	1	3	3	2.1
	V	2,450	1,747	278	39	1,081	1,270	
Portugal	Q	66	58	59	65	59	57	40.1
	V	36,429	3,114	34,998	40,042	36,492	37,953	
Spain	Q	8	5	10	10	14	10	7.0
	V	4,760	4,270	8,709	9,583	11,034	8,181	

3/ Source: Yearbook of Fisnery Statistics, FAO, 1967.

As will be seen from Table B-3 world exports of canned sardines evinced a fall from 182,000 tonnes (valued at $ 84.5 million) in 1961 to 142,000 tonnes (valued at $ 78.8 million) in 1967. It may be noticed that the decline in exports during 1961 to 1967 in terms of value has been less than in terms of the quantity, as the value realised per tonne has increased considerably from $ 464 per tonne in 1961 to $ 555 per tonne in 1967.

Portugal dominates the world sardine trade. It had a share of 40.1 per cent in 1967. Though Portugal's exports of canned sardines declined in terms of quantity by about 14 per cent during 1961 - 1967. its export earnings evinced a marginal increase from $ 36.4 million to $ 37.9 million during this period. South Africa also witnessed a decline in its exports from 67,000 tonnes to 29,000 tonnes during 1961-67.

Direction of Export

A large part of the world trade in canned sardines caters mainly to the requirement of European markets. France, West Germany and UK are the leading consumers of canned sardines absorbing about 80 per cent of the total exports. West Germany is by far the largest importer of this item and the bulk of its supplies come from Portugal.

Prospects

Despite the heavy landings of sardines in India, this fishery does not figure in the country's international trade. The small quantity that is canned at present is mainly geared to the national market for meeting the civilian and defence requirements. The slow development of the fishery is mainly attributed to the lack of suitable type of containers at competitive prices and the non-availability of packing medium - the olive oil.

Sardines have a great potential for export. With more intensive fishing and the availability of processing facilities for canning sardines at important centres on the west coast, their export can be considerably stepped up. The Survey has suggested two canning plants - one at Calicut with a capacity of 20 tonnes and the other at Mangalore, with a capacity of 15 tonnes.

In canning of sardines, considerable difficulties are experienced regarding the size, type and cost of cans. At present round AI tall can (8. Oz. fluid) or flat quarter dingley cans are used for packing sardines. The industry is handicapped in exploiting the export prospects on account of the non-availability of special rectangular cans (402 x 207 x 102) with soldered top and seamed bottom

introduced by Portugal in the international markets. price of this can in India works out to 44 paise which is, however, high as compared to the quarter dingely which is available at 29 paise per can. Recently, a "Ring Pull Can" for sardines, made of aluminium, has been introduced in the market by Norway costing about 24 paise per can. This can is found to be much lighter with better appearance than the three piece can popularised by Portugal in international markets. Besides, the can has a simpler opening contrivance unlike others which have to be opened with the help of a specially provided key. For promoting the export of Indian sardines, it is suggested that this type of can may be made available to the Indian exporters by allowing its import against their entitlement. Simultaneously efforts should be made by the fabricators in India to manufacture such cans at the international price.

The use of refined groundnut oil, at present used in the country as packing medium for the fish, does not seem to be acceptable to the foreign markets, as most of them are used to packs in olive or refined fish oil. If an export market for sardines is to be sought, it will be necessary to allow import of olive oil at a price at which it is available in Portugal and Morocco. Alternatively

it can be packed in refined sardine oil itself, for which sardine oil extraction would have to be developed on an industrial scale.

In view of the intense competition offered by the principal supplying countries like Portugal and Morocco, India can hope to make a dent in the world export trade of canned sardines only if it is able to offer them at a price not more than 75 paise per can as against 80 paise offered by Portugal or 65 paise by Morocco. With a view to neutralising the price differential, it may be necessary to consider this item for a cash subsidy.

With the removal of the inhibitory factors and the implementation of the measures outlined above, it should be possible for India to export 1,250 tonnes of canned sardines valued at Rs 13.00 million by 1973-74 and reach a target of 30,700 tonnes by 1978-79 to earn foreign exchange worth Rs 93.41 million.

In view of the envisaged development programmes of this industry and the potential market prevailing in the UK, it is anticipated that India will capture a considerable portion of this market. On present indications it will be possible for the Indian sardine industry to export 250 tonnes (valued at Rs 2.6 million) by 1973-74 and 6,200 tonnes

(valued at Rs 18.9 million) by 1978-79. In fact, UK will emerge as the principal outlet for Indian sardines in air-tight containers. Other markets that offer promise are West Germany, France, Libya, Sweden and East Germany. The overall position of market prospects for this item are summarised in the following table.

Table B-4

Export Projections for Sardines by Major Markets

Country	1973-74 Qty (Tonnes)	1973-74 Val (Rs million)	1978-79 Qty (Tonnes)	1978-79 Val (Rs million)
UK	250	2.6	6,200	18.9
West Germany	187	1.9	4,600	14.1
France	150	1.6	3,000	9.1
Libya	125	1.3	3,200	9.7
Sudan	115	1.2	3,200	9.7
East Germany	110	1.1	3,000	9.1
Poland	125	1.3	2,800	8.3
Others	188	2.0	4,700	14.3
Total	1,250	13.0	30,700	93.4

1.3 Tuna

Background

Tuna is a high sea fish occuring in shoals in the tropical and temperate seas. World tuna landings in 1968 amounted to 1.4 million tonnes against the total fish landings of 64.0 million tonnes. Intensive fishing of tuna

takes place in the Pacific and the Indian oceans. Japan, USA, Spain and Peru constitute the leading producers of tuna and have maintained this position over the last decade. Of late, Korea and China (Taiwan) have emerged as important producers. In 1967 world exports of tuna were of the order of 193,000 tonnes valued at $ 1.14 million. They represent about 2.5 per cent of the world trade in fishery commodities.

Species

Presently, four principal species of tuna - yellow fin, skipjack, albacore and blue fin are popular in world markets, the first being the most dominant species. Of these, only the first three, namely, yellow fin, skipjack and albacore, are available in the Indian ocean; the first two around 10° south latitude and the latter south of this area.

Tuna Fishing

Tuna fishing in India is still in the primitive stage as the method employed for fishing is the traditional hook and line method, which restricts the fishing operations to the in-shore waters. On the other hand Japan is using modern techniques such as long line and the pole and line method, which are not only easy to operate but also yield

rich harvests. These methods have been instrumental in bringing into operation factory type vessels of sizes ranging between 120' and 130'. These vessels are equipped with all kinds of sophisticated navigation instruments like fish finders, telecommunications, radars and are in addition provided with a processing factory and a cold storage on board. These vessels accompanied by a number of small carrier vessels are engaged in large scale fishing on the high seas, thousands of miles away from Japan and their voyages extend from 4 to 6 months. It is understood that in 1967 including the smaller crafts operating in off-shore waters, the number of vessels engaged by Japan in tuna fishing was 2,114.

Landings

Table C-1 provides the landings of tuna by selected countries.

Trends in Landings

Between 1961 and 1968, world production of tuna increased from 1.2 million tonnes to 1.4 million tonnes or at an average annual growth rate of 1.6 per cent. Japan is the largest producer of tuna. It accounted for about 39 per cent of the total landings in 1968. Japan's tuna landings showed a steady rise from 582,500 tonnes in 1961

Table C-1

Landings of Tuna[1/]
by Major Countries

(in Thousand tonnes)

Country	1961	1963	1964	1965	1966	1967	1968	% of the total in 1968
Japan	582.5	614.3	621.0	597.1	657.4	688.5	545.0	38.90
Spain	35.3	52.1	52.7	58.6	70.4	68.2	66.4	4.74
USA	148.0	147.7	139.9	147.3	130.8	158.6	141.0	10.07
Peru	134.0	118.8	97.2	74.0	83.3	80.8	64.3	4.59
France	36.0	28.7	28.2	35.7	36.5	34.8	51.0	3.64
China(Taiwan)	23.4	28.3	32.2	26.8	44.8	62.1	101.8	7.27
South Korea	0.4	2.6	2.6	8.6	25.5	38.3	43.6	3.11
Total incl. others	1,210.0	1,250.0	1,220.0	1,220.0	1,360.0	1,360.0	1,400.0	100.00

Source: 1/ : Yearbook of Fishery Statistics, FAO, 1968.

to 688,500 tonnes in 1967, indicating a growth of about 18 per cent. There was, however, a sharp decline in 1968 when they dropped to 545,000 tonnes registering a decline of 26.3 per cent over the level of 1967. The decline is attributed mainly to the seasonal nature of the fishery.

USA, which comes next to Japan, contributed a little over 10 per cent. Its landings showed wide fluctuations during 1961-68. Like Japan, after reaching the peak of 158,600 tonnes in 1967, its landings recorded a sharp fall in 1968 when they dropped to 141,000 tonnes representing a fall of 11 per cent on the level of 1967. A perceptible fall was also noticed in the landings of Peru, which declined from 134,000 tonnes in 1961 to 64,300 tonnes in 1968 revealing a drop of 52 per cent. On the other hand, landings of Spain, France, China (Taiwan) and South Korea have increased considerably in recent years. Taiwan has increased its landings from 23,400 in 1961 to 101,800 tonnes in 1968. The corresponding figures for South Korea are 400 tonnes and 43,000 tonnes respectively. This increase is mainly attributed to the increases in their tuna fleet by entering into collaboration arrangement with foreign fishing companies, especially Japanese. In spite of the vast potential of tuna in the Indian ocean, India is still a fringe producer of tuna. The estimated

quantity of tuna landed in India from the coasts of Tamil Nadu, Kerala and Laccadive Islands was only 4,000 tonnes in 1968, as against the world landings of 1.4 million tonnes in that year. Except in the Minicoy and Laccadive Islands, there is no organised tuna fishery in the country. A small quantity of the skipjack variety of tuna is, however, caught from the seas around Visakhapatnam, Tuticorin, Quilon, Ratnagiri, Veraval and the Andamans. Having discovered the high potential of the Indian ocean for tuna, Japan, Taiwan and South Korea are already exploiting it on a large scale in recent years. Japan's annual landings of tuna from the Indian ocean are approximately 150,000 tonnes.

Exports

Composition and Trend. After shrimp, tuna is the next most important constituent of the world fish trade. Of the total world landings of tuna, about 13.5 per cent figured in the world trade in 1968. The fish is popular in the world markets both in frozen and canned forms. Out of the total quantity exported in 1968, 64.6 per cent constituted frozen tuna while 35.4 per cent was exported as canned. Japan and Peru produce tuna both for domestic consumption as well as for exports. The US and EEC countries,

however, consume more than they produce and have to rely heavily on imports. Tables C2 & 3 provide the exports of frozen and canned tuna by selected countries.

Exports of frozen tuna originate mainly from Japan. Small quantities are, however, also being exported from Peru and Spain. During 1961-66 exports of frozen tuna increased from 154,000 tonnes to 192,000 tonnes registering an increase of 22 per cent. But in 1967, there was a fall in exports by about 34 per cent over the 1966 level when exports fell from 192,000 tonnes to 127,000 tonnes. In 1968, exports of this item witnessed a further decline to 122,000 tonnes. This fall in world exports of frozen tuna was mainly due to the decline in landings and increased domestic consumption of the fish in Japan.

Japan enjoys a virtual monopoly in the export of frozen tuna. In 1968, it accounted for 87.7 per cent of the total exports followed by Peru and France with 10.7 and 1.6 per cent respectively. Between 1961 and 1966, Japan's exports of frozen tuna increased from 137,800 tonnes to 177,500 tonnes registering a rise of 28.8 per cent. They, however, fell to 107,100 tonnes in 1968 representing a drop of 10 per cent over the 1966 level. Peru's exports indicated a decline of 10 per cent during this period. France which entered the export trade of

Table C-2

Exports of Frozen Tuna[2/] by Major Countries

Qty: Thousand tonnes
Val: Thousand US dollars

Country		1961	1963	1964	1965	1966	1967	1968	% of the total in 1968 (in terms of quantity)
Japan	Qty	138	146	175	165	178	107	107	87.7
	Val	39,123	46,974	56,744	52,744	1,690	44,882	41,067	
Peru	Qty	20	23	3	3	11	18	13	10.7
	Val	1,788	1,982	1,325	1,325	1,549	2,231	1,614	
France	Qty	-	-	1	1	4	2	2	1.6
	Val	-	-	233	233	1,141	932	569	
Total incl. others	Qty	154	169	179	179	192	127	122	
	Val	41,422	48,956	58,302	84,380	84,380	48,045	43,554	

Source: 2/ : Yearbook of Fishery Statistics, FAO, 1968.

Table C-3

Exports of Canned Tuna 3/ by Major Countries

Qty: Thousand tonnes
Val: Thousand US dollars

Country		1961	1961	1963	1964	1965	1966	1967	1968	% of the total in 1968
Japan	Qty	36	40	44	43	51	55	59		88.0
	Val	29,732	35,211	37,598	35,721	47,562	51,513	54,939		
Peru	Qty	19	12	14	11	11	5	4		5.9
	Val	6,985	5,321	6,368	4,866	5,134	2,159	2,126		
Spain	Qty	4	4	2	2	3	3	1		1.5
	Val	3,135	2,901	4,223	2,662	2,872	3,468	1,195		
Total incl.	Qty	66	64	66	62	69	67	67		
	Val	46,346	50,937	51,013	47,778	60,554	61,431	62,010		

Source: 3/ : Yearbook of Fishery Statistics, FAO, 1968.

frozen tuna in 1964 with an export of 700 tonnes valued at $ 233,000, increased its exports in 1968 to 2,200 tonnes valued at $ 569,900.

Although world exports of canned tuna witnessed a marginal increase of 1.5 per cent from 66,000 tonnes in 1961 to 67,000, in 1968 the export earnings rose considerably from $ 4.6 million in 1961 to $ 6.2 million in 1968, reflecting an increase of 34.7 per cent.

International trade in canned tuna has been dominated by Japan with a share ranging between 64 and 88 per cent during the past decade. Its export trade registered a significant rise of nearly 64 per cent during 1961-68, having increased from about 36,000 tonnes in 1961 to 59,000 tonnes in 1968. During the same period, the increase in terms of value was 84.7 per cent. Though ranked as the second largest exporter of tuna, Peru's contribution to the world exports of canned tuna in 1968 was only 5.9 per cent as against 88 per cent of Japan's exports. Peru's exports declined from 19,000 tonnes in 1961 to 4,000 tonnes in 1968. Spain's exports of canned tuna oscillated between 2,000 to 4,000 tonnes during the period. In 1968, its contribution was only 1.5 per cent to the world exports. Other exporters of canned tuna comprise Morocco, France and Portugal.

India exports a small quantity (approximately 3 per cent of its landings) of tuna in the form of dried and smoked steaks known as 'mas' to Ceylon.

Direction of Exports. USA, Puerto Rico and Italy constitute the major markets for frozen tuna while USA, UK, Canada Italy and West Germany are the important buyers of canned tuna. USA is the largest importer of frozen tuna with a share of 30 per cent followed by Puerto Rico and Italy with a share of 22 per cent each. Other buyers include Spain and Yugoslavia. Out of the total world exports of 67,000 tonnes of canned tuna in 1968, nearly 40 per cent was absorbed by USA while Canada, Italy and West Germany together accounted for a further 19 per cent.

Consumption Pattern

Table C-4 on page 74 shows the aggregate consumption of tuna for selected countries (1960-66).

It is evident from the table that the United States, Japan and the EEC countries are by far the principal consumers of tuna, accounting for about 70 per cent of world consumption.

The per capita consumption shows that Peru, Japan China (Taiwan) and Spain consume more tuna than the USA. This is demonstrated in Table C-5. For most countries, per capita consumption has appreciably increased over the 1960 - 1966 period, presumably indicating secular advances in living standards.

Table C-4

Consumption of Raw and Canned Tuna by Selected Countries (1960-66) 4/

(Thousand tonnes)

Country	1960	1961	1962	1963	1964	1965	1966	1966 as % of total
USA								
Canned	336.2	347.0	333.8	340.4	350.4	409.6	382.8	29.0
Japan								
Raw	190.6	271.9	303.3	289.5	243.8	257.6	353.0	26.7
Canned	46.0	58.4	39.0	40.0	31.8	18.4	25.8	2.0
Total	236.6	330.3	342.3	329.5	275.6	276.0	378.0	28.7
EEC								
Canned	130.0	131.4	142.8	152.8	153.8	158.2	159.0	12.0
Spain								
Raw	12.2	7.5	17.8	13.4	21.5	15.0	31.8	2.3
Canned	25.2	20.8	28.4	23.8	25.8	37.6	37.8	2.9
Total	37.2	28.3	46.2	37.2	47.3	52.6	69.6	5.3
Peru								
Raw	59.0	108.6	58.6	89.3	80.3	35.0	50.2	3.8
China (Taiwan)								
Raw	15.8	21.0	29.2	22.6	25.0	22.6	38.0	2.9
Canned	1.4	2.4	3.0	5.6	7.2	4.2	6.8	0.5
Total	17.2	23.4	32.2	28.2	32.2	26.8	44.8	3.9
Total								
Raw	459.1	586.0	599.1	593.6	542.0	509.0	578.0	43.8
Canned	598.0	548.0	644.0	664.0	670.0	696.0	742.0	56.2
Grand Total	1057.1	1234.0	1243.1	1257.0	1212.0	1205.0	1320.0	100.0

4/ Source: International Conference on Investment in Fisheries, FAO, 1969.

Table C-5

Per Capita Consumption of Raw and Canned Tuna by Selected Countries (1960-66). 5/

(Pounds)

Country	1960	1961	1962	1963	1964	1965	1966
Peru							
Raw	13.0	23.24	12.19	17.89	15.60	6.65	9.22
Japan							
Raw	4.51	6.37	7.04	6.65	5.54	5.80	7.87
Canned	1.09	1.37	0.91	0.92	0.72	0.41	0.58
Total	5.60	7.74	7.95	7.52	6.26	6.29	8.45
China (Taiwan)							
Raw	3.14	4.00	5.46	4.12	4.44	3.82	3.60
Canned	0.28	0.46	0.56	1.02	1.28	0.71	1.12
Total	3.42	5.52	6.02	5.14	5.72	4.53	7.42
Spain							
Raw	0.89	0.54	1.27	0.95	1.51	1.05	2.20
Canned	1.83	1.50	2.03	1.69	1.82	2.62	2.61
Total	2.72	2.09	3.30	2.64	3.33	3.67	4.81
USA							
Canned	4.10	4.16	3.94	3.96	4.02	4.64	1.40

5/ Source: International Conference on Investment in Fisheries, FAO, 1969.

Prices

Table C-6 shows the varying trends of tuna prices for selected countries during the years 1960 to 1966. It may be seen from the table that while the US prices of frozen tuna (ex-vessel) have remained stable, the prices of tuna in other countries both frozen and canned (including canned in USA) have moved up.

Table C-6

Prices of Frozen and Canned Tuna

(in cents per pound)

Frozen (ex-vessel)

Country	1960	1961	1962	1963	1964	1965	1966
USA	12.4	12.9	14.5	12.6	12.8	13.0	13.6
Japan	15.2	15.9	14.0	15.5	15.2	16.2	17.9
Spain	10.2	13.7	17.1	11.6	14.5	18.3	18.3
China (Taiwan)	9.7	7.5	6.2	9.2	7.3	8.9	12.6

Canned (wholesale)

USA	57.3	60.9	62.5	61.7	62.2	65.0	68.5
Japan	35.5	38.0	38.9	39.7	38.8	37.7	42.6

Tuna Fishery in Selected Countries

Tuna fishery in selected countries is reviewed briefly below:

Japan. Tuna is fished by the Japanese in the Northern and Southern Pacific, the Indian Ocean and the Atlantic Ocean by tuna long liners equipped with deep freezers and sophisticated navigation instruments. The sizes of the fishing vessels and gears used for this purpose vary according to the fishing grounds. The vessels operating in the adjacent seas are mostly of 30-40 tonne size and those operating in the high seas are mostly of 200-500 tonne size. Most of the larger ships equipped with processing factories have their landing and supply bases at foreign ports. The number of vessels operating from foreign bases has gradually increased from 86 in 1960 to 247 in 1964, - 77 at Samoa, 16 at Santos, 37 at Numea and 18 at Fiji in the Pacific Ocean, 25 at Penang in the Indian Ocean and 4 at St. Martin in the Atlantic Ocean. Including the smaller crafts operating in off-shore waters, the number of vessels engaged in tuna fishing was 2,114 with a total production of 429,000 tonnes in 1967. In addition to this the catch of tuna by the traditional pole and line method amounted to 221,000 tonnes. Thus the

total catch of tuna in 1967 amounted to 650,000 tonnes representing about 50 per cent of the world catch of tuna. The bulk of the fish caught is frozen or canned, and exported to USA and West Germany. Exports of tuna products from Japan constitutes about 30 per cent of its total exports of marine products.

Taiwan. Taiwan entered into long line fishing for tuna in a big way in 1960. It is operating in the Atlantic and South Pacific Oceans. From 1963 onwards, it also started fishing in the Indian ocean, and for this purpose, an ambitious programme for construction of deep sea tuna long line fishing vessels of 145 tonnes and 250 tonnes class was pushed through with an American Aid Loan and an IBRD loan. The landings of tuna by Taiwan increased from 23,400 tonnes in 1961 to 101,800 tonnes in 1968.

South Korea. With the launching of deep sea fishing by South Korea on experimental basis in the Indian Ocean in 1967, its landings of tuna fish have registered a phenomenal increase, rising from 400 tonnes in 1961 to 43,000 tonnes in 1968. Tuna fisheries near Samoa developed with financial aid from the Government credit, private banks and loans from Italy and France, have made remarkable progress.

At the end of 1966, 138 tuna vessels were operating in the South Pacific, Atlantic and Indian Oceans under the South Korean flag. It is expected that the number of vessels will increase to about 300 by 1970. At present the Government Fishing Company - Korean Marine Industrial Development Corporation - operates a fleet of 70 tuna long liners in addition to a fleet of 70 tuna long liners in addition to a further 110 tuna vessels which are operated by private fishing companies.

Prospects

There is a vast potential for tuna fishery in the Indian Ocean (estimated at 250,000 tonnes per year by FAO). Japan, Taiwan and South Korea are exploiting it on a large scale. Japan accounts for an estimated landing of 150,000 tonnes of tuna annually from the Indian ocean. Taiwan recorded an appreciable rise in their landings from the Indian Ocean in recent years, and has increased total landings from 23,400 tonnes in 1961 to 101,800 tonnes in 1968. Similarly South Korea increased its tuna landings from 400 to 43,000 tonnes during this period, bulk of which was harvested from the Indian Ocean. India has, however, not been able to take advantage of it. Lack

of tuna fishing vessels, trained personnel and technical facilities are the major factors which have restricted its fishing to the coastal waters only.

Considering that the development of the tuna fishery will require a huge amount of investment and expertise, the desirability of India entering into collaboration with some of the experienced companies in Japan, Korea or USA merits serious consideration. Under this arrangement the collaborating firm can be requested to supply the capital equipment and know-how and assist in the training of the Indian personnel. The collaboration can also be sought for developing the processing and marketing of tuna.

The rising home demand in Japan in recent years, may compel her to divert an increasing proportion of its production to meet the domestic needs. In the circumstances, Japan may not be in a position to meet the growing US demand to the extent that it has been doing in the past. USA thus offers a potential market for India's tuna, if India can offer it at competitive prices* and conforming to the international standards of quality. Other markets that offer considerable scope for India's tuna are Japan, Canada, Italy and West Germany.

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*The prevailing wholesale price of tuna in the US market ranges between $ 12.13 and $ 13.30 per case of 48 cans of 6½ oz each.

It is envisaged that with proper development, India will be able to make a beginning with the export of 100 tonnes of tuna valued or Rs 0.6 million by 1973-74 to reach a level of 1,200 tonnes valued at Rs 7.20 million by 1978-79. The following table gives an idea of export prospects of canned tuna in the Fourth and Fifth Plans.

Table C-7 : Export Projections for Tuna, by Market

Country	1973-74		1978-79	
	Qty (Tonnes)	Val (Rs million)	Qty (Tonnes)	Val (Rs million)
USA	30	0.18	360	2.1
Japan	20	0.12	240	1.4
Canada	15	0.09	190	1.1
West Germany	20	0.12	240	1.4
Italy	10	0.06	120	0.8
Others	5	0.03	60	0.4
Total	100	0.60	1,200	7.2

1.4 Bombay Duck

Background

Bombay duck, Harpodon nehereus, locally known as 'Bombil' in Maharashtra and 'Bomla' in Gujarat, constitutes one of the major fisheries of the country. The fish is characterised by the cylindrical body and a large mouth armed with pointed teeth. Bombay duck is a shoaling fish.

It is caught in the inshore region during the seasons extending from September to December and from February to April.

Bombay Duck Fishing

Along the North-west coast, Bombay duck is caught mainly by the 'Dol' nets (a type of fixed bag net) which are set from boats in a radius of 6 to 7 kms to 40 to 50 kms from the shore and the boats stay out in the sea for over 30 hours. On Andhra coast, boat seines are popular while in Orissa fixed bag nets are used. In the estuaries of West Bengal, they are caught in the 'Behundijal', a fixed type of bag net.

Landings

Bombay duck is found in Gujarat and Maharashtra on the west coast and Andhra Pradesh and West Bengal on the east coast. The Table D-1 presents the position of Bombay duck landings in relation to India's marine fish landings during the year 1961-68.

Table D-1

Landings of Bombay Duck[1/] in India

(Tonnes)

Year	Bombay Duck	All Marine Fish	% Share
1961	93,844	683,569	13.7
1963	91,870	655,484	9.5
1964	81,342	859,582	9.5
1965	73,894	832,777	8.9
1966	77,363	890,311	8.7
1967	74,912	891,888	8.6
1968	82,407	932,765	9.2

Trends in Landings. Bombay duck which constituted 13.7 per cent of the total marine fish landings in 1961 showed a steady decline till 1967 when its share reached the lowest level of 8.6 per cent. This has, however, improved to 9.2 per cent in 1968. During the period 1961-68, the landings of Bombay duck showed a decline of about 12 per cent as against a rise of 36.5 per cent in the all-India landings of marine fish during the same period. As can be seen from the above, while the total fish landings have been progressively mounting, there have been wide fluctuations in the landings of Bombay duck. In 1961, the total catch of Bombay duck was 93,844 tonnes. It decreased to 91,870 tonnes in 1963, it rose to 77,363 tonnes in 1966. In 1967,

it dropped again to 74,912 tonnes, but picked up to 82,407 tonnes in 1968. These fluctuations are ascribed to the seasonal nature of the fishery.

Landings in Maritime States of India. Bombay duck is landed in large quantities along the Gujarat and Maharashtra coasts, the important landing centres being Jaffrabad, Rajpara, Umbergaon, Satpati and Versova. These two States account for about 90 per cent of the landings. The fish is also caught on the Andhra and Orissa coasts and the estuaries of West Bengal in small quantities.

Table D-2 provides the statewise landings of Bombay duck since 1961.

Table D-2

Statewise Landings of Bombay Duck[2/]

(tonnes)

	1961	1965	1966	1967	1968
Andhra Pradesh	555	438	524	730	657
Gujarat	66,235	49,347	45,734	84,806	53,676
Maharashtra	26,892	23,885	30,899	28,123	25,704
West Bengal	159	195	129	1,227	2,456
Total incl. others	93,844	73,894	77,363	74,912	82,407

2/ Source: Central Marine Fisheries Research Institute, Mandapam Camp.

Landings of Bombay duck in Gujarat which contributed 65 per cent to the total landings in 1968 decreased from 66,235 tonnes in 1961 to 53,676 tonnes in 1968. Maharashtra which ranks second in the landings of Bombay duck witnessed a fall of 4.4 per cent from 26,892 tonnes in 1961 to 25,704 tonnes in 1968.

Disposition

About 20 per cent of the total catch is consumed in the fresh form and the rest is sundried. Icing has not proved to be a satisfactory method for the preservation of this fish. Crushed ice lacerates the flesh and the melting ice causes bacterial infection. The fish is, therefore, mostly consumed in the dried form.

Processing

Non-laminated Bombay Duck. Sun-drying of Bombay duck on scaffolds is the traditional method of preservation of the fish on the Maharashtra and Gujarat coasts. The fish, after being washed in sea water, is locked in pairs at the jaws and hung on ropes tied between poles to be dried in the natural breeze and heat. Complete drying of the product requires 3 to 5 days depending on the weather conditions. After 3 to 4 days the fish is removed from the scaffolds, and further dried by spreading on palmyra mats. The product has strong offensive odour and yellowish brown colour. Some improvements have recently been introduced

in the method of drying. Fishes are now hung for drying at greatef distance from each other with the result that drying is effected more quickly and uniformly with less spoilage.

Laminated Bombay Duck. Fresh Bombay ducks are washed thoroughly in sea water and partially dried by hanging on scaffolds usually taking more care to leave a small gap between the adjacent fish to facilitate easy drying. The drying is continuous for 6 to 8 hours during the day time or 8 to 12 hours during the night. The initial drying brings down the moisture content to about 60 per cent from the original 88 per cent and lends the fish the required toughness. The head and fins of the partially dried fish are removed. A deep cut is made along the belly portion and the entrails removed. Similar longitudinal cuts are made with sharp knife and the vertebral column is removed. The fish is then washed in potable water containing 1 to 2 per cent salt and 0.05 to 0.1 per cent citric acid. The fish is flattened and spread over wire mesh trays on bamboo platforms and dried in the sun till the moisture content is brought down to about 10 per cent. The laminated fish is pressed individually by passing through a roller press. The individual pieces are trimmed into uniform size and shape. This new method of preparing

Bombay duck in the laminated form holds out better prospects and hence in future the emphasis has to be shifted from simple sun-dried Bombay duck to laminated Bombay duck.

Quality Standards

Essential features of the specifications for quality standards for dried and laminated Bombay duck are given below:

Requirements for Dried and Laminated Bombay Duck

	Dried Bombay Duck	Laminated Bombay Duck
1. Moisture % by weight-maximum	15	15
2. Sodium Chloride (on moisture free basis) % by weight-maximum	7.5	6
3. Acid insoluble ash % by weight-maximum	1.0	1.0

Exports

Only a negligible portion (about 0.3 per cent) of the sundried product enters the export trade of India, the rest is marketed internally. Table D-3 shows the exports of dried Bombay duck from India since 1964.

Table D-3

Exports of Bombay Duck from India[3/]

Qty: Tonnes
Val: Thousand Rupees

Year	Qty	Val	Unit Value
1964	669	1,383	2.
1965	463	989	2.13
1966	130	565	4.34
1967	216	860	4.00
% Change in 1967 over 1964	-32.2	-37.8	-

Exports of Bombay duck have declined since 1964. From 669 tonnes it fell by 32.2 per cent to only 216 tonnes in 1967. In terms of value, however the decline has been less, as the value realised per tonne has increased considerably from Rs 2,060 in 1964 to Rs 4,000 per tonne in 1967.

Direction of Exports. Mauritius, Kenya, Uganda, Tanzania, Ceylon, Singapore and Indonesia constitute the principal markets for dried Bombay duck, where it is normally sold at an average price of Rs 3/- per kg. However, laminated Bombay ducks have opened new markets even in Europe, especially in UK.

3/ Source: Department of Fisheries, Government of Maharashtra and Gujarat.

Prospects

The survey has revealed that there is good potential for the export of laminated Bombay duck in Europe and USA, where it can be popularised as a favoured snack in the bars, provided its quality can be improved by the adoption of improved methods of processing e.g. by the introduction of mechanical handling and drying to maintain its freshness and crispness. With a view to facilitating this, project proposals have been recommended by the Survey Team at three centres viz. Jaffrabad, Umbergaon and Versova.

It has been noticed that after each haul the fishes are piled upon the deck in a dump instead of arranging them side by side in a systematic manner on the boat. Thus the fishes subjected to heavy pressure in the bottom layers are damaged. The same also applies to the storage of the finished product prior to final shipment. It is also necessary to protect the fish from insects and maggots. It is therefore essential that the product after drying and processing, is once again oven dried and sealed immediately in polythene bags before packing.

Special care needs to be exercised with regard to packing Bombay ducks. The product should be packed in ~~poly-thene-lined~~ double gunny bags to prevent absorption of moisture in transit. The master cartons in which

laminated Bombay ducks are packed at present also need considerable improv ment, so that the content within are preserved in quality and shape. At present pre-ent 25 laminated Bombay ducks are packed in an individual carton which is too large for the number and consequently there is a certain amount of squashing of the cardboard containers, which damages the appearance and affects the value of the product. A suitable outer case will obviate the crushing. This can be achieved by packing larger number of the product or reducing the size of the box.

The entire quantity of laminated Bombay duck can find an export market if strict hygienic conditions are maintained and perfect and attractive packing is resorted to. It is envisaged that India will be able to realise an export of 3,100 tonnes (valued at Rs 14.40 million) by 1978-79 if the steps outlined above are implemented.

1.5 Lobster

Background

Lobster which belongs to the crustacean group is exploited commercially all over the world in five major varieties - Spiny lobster, Norway lobster, Northern lobster, European lobster and Squat lobster.

Species

Spiny lobster (Palimurus) is found mainly in the seas around Australia, Cuba, South Africa, Japan and India; Norway lobster (Nephropsiorvegieus) in the temperate areas off France and Spain; Northern lobster (Homarus, Americanus) in the Atlantic Ocean around Canada and USA; European lobster (Homarus vulgaris) near UK and Italy, while the entire catch of Squat lobster (Galatheidae) is from Chile.

The only variety of lobster found around India is the Spiny lobster. It occurs off the coasts of Maharashtra and Kerala and in the Palk Bay.

Lobster Fishing

Lobster fishing in India is normally done by the traditional method of using lobster traps or pots. In addition to the traps, anchor hooks have also proved an effective gear and are used along the south-west coast. Nets for lobster fishery are used only rarely. It is understood that gill nets are used only in Maharashtra. In other countries of the world more sophisticated methods are being used which have a much wider range and yield much larger catches. In Australia, lobsters are caught by operating small boats usually ranging between 16' to 25'

with hulls designed for high speed and equipped with echo-sounders. The boats are fitted with pot-hauling gears or pot tippers. Some of the boats contain fish wells or deck tanks for holding lobsters, thereby can stay longer on the grounds. Others keep the catch in crates at the anchorage to await the arrival of a carrier vessel which takes lobsters to mainland for processing. The gear used for lobster fishing generally consists of batten, wire sticks, cane or steel pots of the beehive or rectangular type.

Landings

Table E-1 provides the catch data of lobsters by major countries of the world.

Table E-1

World Catch of Lobsters 1/

(Thousand tonnes)

Country	1961	1964	1965	1966	1967	1968
Chile	-	10.7	15.4	13.4	20.0	18.2
Canada	21.0	19.0	18.4	17.0	15.9	16.4
Australia	12.5	12.0	12.0	13.6	14.4	15.1
USA	12.7	14,0	13.7	13.4	12.1	14.7
US	6.2	7.9	7,8	9.8	10.5	11.1

1/ Source: Yearbook of Fishery Statistics, FAO, 1968.

Table E-1 (Contd.)

Country	1961	1964	1965	1966	1967	1968
Cuba	8.2	6.6	9.1	9.0	8.3	8.9
France	8.9	9.7	7.8	9.0	7.9	8.3
South Africa	8.7	8.4	8.4	8.0	8.3	6.7
Spain	2.9	3.2	3.8	4.2	4.7	4.5
Total incl. others	114.3	133.0	135.0	137.0	139.0	146.0

Trends in Landings. It may be seen that there has been a moderate but steady increase in the landings of lobsters rising from 114,300 tonnes in 1961 to 146,000 tonnes in 1968, witnessing an average annual growth rate of 1.7 per cent.

The largest producers of lobsters are Chile (18.2 thousand tonnes), Canada (16.4 thousand tonnes), Australia (15.1 thousand tonnes). The other main producers are UK (11.1 thousand tonnes), Cuba (8.9 thousand tonnes), France (8.3 thousand tonnes) and South Africa (6.7 thousand tonnes). Production figures show a rising trend in Australia (20.8), UK (79.0), Cuba (8.5), USA (15.7), Spain (55.1) and decline in Canada (22.0), France (6.7) and South Africa (24.7). Figures within the brackets show the increase/ decrease in percentage during 1968 over the 1961 level.

Lobster Fishery in India. India's share in the total spiny lobster catch is very small. No detailed statistics are available about the catch of lobsters in India. Assuming that lobsters constitute about 50 per cent of the catch of "other crustaceans", it is estimated that the total catch of lobsters in 1968 was 1797 tonnes.

Lobster fishery in India is mainly concentrated in the south east and south west coasts of India in the States of Tamil Nadu, Andhra Pradesh and Kerala. Tamil Nadu ranks first with about 70 per cent of the total landings with Kolachel and Kanyakumari as the main fishing grounds, followed by Andhra Pradesh, Kerala and Maharahstra. Recently, lobster fisheries have been developed on the Saurashtra coast and near Mandapam in the Gulf of Mannar.

Processing and Grading

The tails of the lobsters are washed in clean water, wrapped individually, wholly or partially in moisture proof film and quick frozen (Plate or Blast freezers) at -40°C.

The tails are graded into the following sizes:

Super Jumbo	above 340 gm/tail
Jumbo	285 - 340 gm
Large	225-- 284 gm

Medium	170 - 224 gm
Small	115 - 169 gm
Extra small	50 - 114 gm
Tiny	Below 50 gm

Exports

Lobsters occupy a prominent place in the international market. Approximately 98 per cent of the exports are effected in frozen form, while a negligible quantity (about 2 per cent) is exported as canned. The world export of frozen lobster is given in Table E-2. It may be seen that world exports of frozen lobsters were more or less static during 1961-68. Canada (8,800 tonnes) Australia (5,000 tonnes) and South Africa (5,900 tonnes) constitute the major exporters of frozen lobsters with their combined share amounting to about 85 per cent of world exports. Mexico, Denmark Brazil and Norway come next in order of importance. Bulk of the exports are directed to USA. A negligible quantity is consumed by Netherlands, Sweden and France.

A beginning was made by India in the export of this item in 1963 and since then exports have gone up. Exports of lobster tails from India have shot up from 53 tonnes in 1963 to 297 tonnes in 1968. In terms of value, the

Table E-2

World Exports of Frozen Lobster 2/

Qty: Thousand tonnes
Val: Thousand US dollars

Country		1961	1963	1964	1965	1966	1967	1968	% of total in 1968 by Qty
South Africa	Qty	5.2	5.6	5.9	6.2	5.2	4.6	5.9	25.3
	Val	10,469.0	11,662.0	11,844.0	12,606.0	10,299.0	9,717.0	12,163.0	
Canada	Qty	10.9	11.0	10.8	10.2	8.9	9.3	8.8	37.7
	Val	18,332.0	18,926.0	21,026.0	23,850.0	20,456.0	21,558.0	22,409.0	
Australia	Qty	5.5	4.7	4.9	3.7	4.5	5.3	5.0	21.4
	Val	15,738.0	12,650.0	13,487.0	15,740.0	20,465.0	20,655.0	25,245.0	
Total incl. others	Qty	25.3	24.7	24.9	23.1	21.6	21.6	23.3	
	Val	51,239.0	49,524.0	51,781.0	50,172.0	58,582.0	57,648.0	69,489.0	

Source: 2/ : Yearbook of Fishery Statistics, FAO, 1968.

rise was from Rs 312,000 in 1963 to Rs 6,683,000 in 1968. While the quantity exported showed a decline in 1964 and 1966, the export value has increased continuously as can be seen from the following table.

Table E-3

Exports of Frozen Lobster Tails from India 3/

Qty: Tonnes
Val: '000 Rs

Country		1963	1964	1965	1966	1967	1968
USA	Q	53	41	111	80	128	296
	V	312	371	1,274	1,474	2,357	6,660
Italy	Q	-	Neg	Neg	-	-	4
	V	-	Neg	Neg	-	-	10
France	Q	Neg	-	Neg	-	-	4
	V	Neg	-	Neg	-	-	14
Total incl. others	Q	53	41	111	80	128	297
	V	312	371	1,275	1,474	2,357	6,684
Share in marine products exports	Q	0.30%	0.19%	0.72%	0.42%	0.59%	1.20%
	V	0.53%	0.54%	1.84%	1.09%	1.18%	3.03%

Despite rapid gains, lobster tail exports are still not more than 1.2 per cent of the total quantity and 3.03 per cent of the value of the total marine products exports. The main market for frozen lobster tails is USA.

3/ Source: Marine Products Export Promotion Council, Ernakulam.

US Imports of Frozen Lobster

The USA has been the major market for Indian lobster tails although its share in the total US imports of this commodity is negligibly small. In 1968, it accounted for only 1 per cent of the total US imports (27,132 tonnes) as seen from the Table E-4. Other important suppliers in order of importance, to the US market include Canada (28%), South Africa (18.7%), Australia (18.2%), New Zealand (10.2%) and Brazil (5.8%).

Table E-4

US Imports of Frozen Lobsters[4/]

(Tonnes)

Country	1963	1964	1965	1966	1967	1968	% of total in 1968
Canada	9,910	9,281	8,438	7,768	7,663	7,648	28.0
South Africa	4,616	5,590	5,560	4,951	3,921	5,090	18.7
Australia	4,198	3,680	4,222	4,389	4,695	4,957	18.2
New Zealand	1,350	361	1,359	1,622	2,125	2,722	10.0
Brazil	1,804	1,310	1,218	1,122	740	1,574	5.8
India	53	41	112	181	128	296	1.0
Total incl. others	25,254	25,166	25,588	24,480	23,091	27,132	100.0

4/ Source: Marine Products Export Promotion Council, Ernakulam.

Prices

The wholesale prices of Indian lobster tails in the US market during the month of September 1969 and the comparative prices secured by some of the competing countries, are indicated in Table E-5.

Table E-5

Wholesale Prices of Frozen Lobster Tails in the US Market 5/

September, 1969

Country of Origin	Price US Cents per Pound (Monthly Average) 1-2 oz	2-4 oz	4-6 oz	6-8 oz	8-10 oz	10-12 oz	12-16 oz
Australia	-	-	339.2	305.0	305.0	305.0	300.0
Japan	-	-	218.1	218.1	218.1	-	-
Brazil	-	178.1	247.5	246.9	239.4	-	-
India and Pakistan	110	154.4	228.1	288.1	288.1	-	-

It is clear from the above table that the prices realised by the Indian lobsters tails for comparable grades have been lower than those of competing countries in US

5/ Source: "Green Sheets" Published by Bureau of Fisheries, Department of Interior, USA.

market largely because these countries endeavour to export bigger varieties and discourage the catching and processing of small ones. Further, the marketing of one or two brands through a common sales organisation, South Africa and Australia are able to promote their sales considerably.

Lobsters Fishery in Selected Countries

A review of lobster fishery in some of the countries is presented below:

Cuba. Lobsters in Cuba are concentrated in Pina del Rio, Havana and Las villas region. There are more than 20 fishermen cooperatives engaged in catching lobsters. The lobsters are normally caught in traps and are transported by live-well vessels to collection centres where they are held until processed. If the lobsters are found under-sized or weak they are held in large 'lobster corrals' (as large as 1,200 square metres and 10 ft. deep) in many collection centres until they are deemed to be of marketable quality. They are then lifted by dipnet.

In 1967 total catch of lobsters in Cuba was 8,300 tonnes. Since import of lobsters of Cuban origin is prohibited in USA, most of the catch is exported to France and Canada either in canned or frozen form.

Mexico. Lobster fishery in Mexico is concentrated along the outer coast of the peninsula of Baja California. However, recently a new fishery has developed in Quintana Roo on the Caribbean coast.

The main fishery areas for lobsters are north of Bahia Magdalena, Gulf of California and the Caribbean Seas. The fishery is protected by closed season and size limits.

In 1967 the catch of lobster in Mexico was 1571 tonnes(live weight), of which Baja California had the major share.

Marketing of lobster for domestic consumption as well as for export is controlled rigidly by a large number of cooperatives which are licensed to fish either for export or for the domestic market, but not both. Lobsters meant for export are delivered alive, from the scattered camps by truck, small plane or carrier ship to a single processing plant in Ensenada, which is operated by the National Bank for Cooperatives (BANFOCO) which finances the fishermen.

Marketing in the new Caribbean fishery has developed differently. Here the individual dealers can buy from the cooperative associations and ship directly to US importer.

All Carribean lobsters for export are shipped as frozen, uncooked tails, while for domestic market they are sold either in whole or as tails.

Venezuela. About 90 per cent of lobsters in Venezuela are captured in the Los Roques from May to September. Lobsters are caught in lobster traps. Landings currently average to 10 to 12 centimetres in length and weight about one to two kilos each. The catch is sold at La Guaira at a price $ 1.35 per kilo (wholesale) and at $ 2.70 a kilo(retail). During 1967 the total catch of lobsters in Venezuela was 113 tonnes(live weight)valued at $ 117,432.

Prospects

With a rising world demand and the location of additional sources of deep sea lobster along the coast line of India as a result of explorations conducted by the Indo-Norwegian Project, it should be possible for this fishery to make a progressively larger contribution to the total trade of marine products of the country. The Indo-Norwegian Project has located good concentrations of lobsters in the deep seas off Kerala at a depth of 200 to 300 metres along the continental slope. Fishing for lobsters from deep seas would necessitate introduction of larger vessels of 22m. length. This would strengthen the

resource base necessary for exporting and cultivating the potential markets available for Indian lobster tails abroad. Besides, it would also be necessary to ensure the high quality of the product and to arrange for its proper grading and packaging. The product should be under compulsory quality control. With the introduction of right type of fishing gear and improvement in the quality of the product, it would be possible for India to increase the export of this item from 393 tonnes in 1968-69 to 500 tonnes in 1973-74 and to 2,458 tonnes by 1978-79 yielding a return of Rs 43.50 million in foreign exchange.

The marketwise export projections of this item are indicated below:

Table E-6 : Export Projections for Lobstertails, by Markets

Country	1973-74		1978-79	
	Qty (Tonnes)	Val (Rs million)	Qty (Tonnes)	Val (Rs million)
USA	400	9.60	1,966	34.80
Scandinavia	40	0.96	198	3.48
UK	30	0.72	147	2.61
Spain	30	0.72	147	2.60
Total	500	12.00	2,458	43.50

1.6 Mackerel

Species

Mackerel is a pelagic shoaling fish and is comparatively abundant in the Atlantic and Indo-Pacific oceans. The commercially important varieties of the fish are the Indian mackerel (Rastrelliger Kanagurta) and Spanish mackerel (Scomberomorus).

Mackerel Fishing

Mackerels are normally caught by three types of gear viz. trawl lines, gill nets and pound nets. Among these, the gill nets have proved to be most effective. Boat seines and shore seines are also found to be in use in certain places. In India, the most common net used in the catch of mackerel is the shore seine called "Rampani" net, which consists of 400 to 600 pieces made by hemp or cotton yarn joined together and operated by 80 men with the help of five trigger boats. In India, the fishing season for mackerels extends from August to February in the southern areas of Kerala coast, while along the coast Mysore it begins in September and extends upto April. Further north in the Ratnagiri region there is a rather short fishing season from late October to February.

Landings

Table F-1 presents landings of mackerel by major countries of the world.

Trends in Landings. Mackerel landings of the world in 1968, amounted to 2.3 million tonnes against the total world fish landings of 64.0 million tonnes. Between 1961 and 1968 its landings increased from 0.7 million tonnes to 2.3 million tonnes, or at an average annual growth rate of 17.1 per cent. Japan which is the leading mackerel producing country in the world contributed nearly 45 per cent to the total landings in 1968. Its landings in 1968 amounted to 1,035,000 tonnes, which witnessed a significant increase of more than 200 per cent over the level of 340,900 tonnes in 1961. Japan is followed by Norway accounting for more than 33 per cent. Its landings increased from 28,700 tonnes in 1961 to 779,100 tonnes in 1968 or at an average annual growth rate of 13.7 per cent. Thailand, Malaysia, South Africa, France and India are the other mackerel producing countries, contributing an additional 18 per cent to the world landings. Although landings in these countries constitute a negligible proportion of the total landings, their growth rate, barring India, has shown a sharp rise during

Table F-1

Mackerel Landings by Major Countries[1/]

(in Thousand Tonnes)

Country	1961	1962	1963	1964	1965	1966	1967	1968	% of the total in 1968
Japan	340.9	412.2	468.5	500.0	647.4	631.0	694.5	1,035.0	44.4
Norway	28.7	20.6	23.4	51.4	158.5	481.4	868.6	779.1	33.4
Thailand	23.3	36.1	23.2	52.5	69.9	87.6	93.1	148.1	6.4
Malaysia	19.2	27.1	20.2	22.0	25.8	33.4	64.4	102.5	4.4
South Africa	52.3	21.2	13.4	52.0	39.8	55.6	138.9	90.0	3.9
France	9.9	7.1	41.4	42.0	39.0	43.4	44.3	40.5	1.8
India	34.4	29.1	76.9	23.8	43.0	31.9	29.4	21.7	0.9
Total incl. others	774.0	842.0	794.0	918.0	1,155.0	1,437.0	2,045.0	2,330.0	100.0

Source: 1/ : Yearbook of Fishery Statistics, FAO, 1968.

the period 1961 to 1968. India's landings of Indian mackerel showed a decline of about 37 per cent between 1961 and 1968. The total mackerel landings in India in 1968 were 21,703 tonnes as against 34,485 tonnes in 1961. In 1968, its contribution to the world mackerel landings was less than 1 per cent.

Landings in Maritime States of India. In India, mackerels are found on the West coast from Ratnagiri to Quilon, and on the east mainly on Madras coast. Small quantities are also landed in the northern Andhra coast.

Table F-2 presents the statewise landings of mackerel in India.

Table F-2

Statewise Landings of Mackerel in India[2/]

(Tonnes)

State	1961	1965	1966	1967	1968
Andhra Pradesh	1,176	1,155	2,065	2,062	2,249
Kerala	20,044	18,026	10,747	4,495	3,599
Mysore	7,276	18,119	7,102	15,050	5,773
Tamil Nadu	5,607	521	1,925	3,360	3,306
Total incl. others	34,485	43,095	31,959	29,445	21,703

2/ Source: Central Marine Fisheries Research Institute, Mandapam Camp.

Mysore, Kerala on the west coast and Tamil Nadu and Andhra Pradesh on the east coast are the major mackerel producing States in India. It is seen from the table that, barring Andhra Pradesh, mackerel landings in all the States have declined considerably. Kerala, which is the leading State in India in the production of mackerel witnessed a sharp fall from 20,044 tonnes in 1961 to 3,599 tonnes in 1968, reflecting a decline of 82 per cent. Mysore which ranks second in mackerel landings also evinced a fall during the period. Its landings fell from 7,276 tonnes in 1961 to 5,736 tonnes in 1968. Tamil Nadu's landings declined from 5,607 tonnes to 3,306 tonnesduring 1961-68. Andhra Pradesh, however, witnessed an increase in its landings from 1,176 tonnes in 1961 to 2,249 tonnes in 1968.

Exports

Composition and Trend. International trade of mackerel takes place mainly in canned form. However, a negligible quantity is also exported as frozen and dried. In 1968 out of 140,600 tonnes of exports of mackerel 88 per cent took place in canned form while 10 per cent in frozen and 2 per cent in dried form.

Exports of canned mackerel recorded a sharp rise both in terms of quantity and value during the period 1961-68, the former from 21,700 tonnes to 123,800 tonnes, or at an average annual growth rate of 28 per cent and the latter from $ 8.4 million to $ 44.0 million, or at an average annual growth rate of 25 per cent.

Japan is the largest exporter of canned mackerel, accounting for more than 94 per cent of the total exports in 1968. Its exports have risen significantly from about 10,000 tonnes in 1961 to 116,800 tonnes in 1968. Japan is followed by Morocco, contributing about 5 per cent to the world exports in 1968. Other important suppliers of canned mackerel include Portugal, Norway and USA. Table F-3 presents the exports of canned mackerel by major countries.

Norway, Japan and Canada are the major exporters of frozen mackerel. Exports of frozen mackerel were 14,400 tonnes (valued at $ 2.57 million) in 1968, as against 3,300 tonnes (valued at $ 0.53 million) in 1961, or rose at an average annual growth rate of 23 per cent during this period. Norway is the leading exporter of frozen mackerel to the world markets holding a share of 72.2 per cent. The contributions of Japan and Canada are 20.8 per cent and 6.7 per cent respectively. Table F-4 provides the exports of frozen mackerels by major countries.

Table F-3

Exports of Canned Mackerel[3/]
by Major Countries

Qty: Thousand tonnes
Val: Thousand US dollars

Country		1961	1963	1964	1965	1966	1967	1968
Japan	Q:	9.8	21.9	33.3	26.2	53.9	71.2	116.8
	V:	3500.0	7195.0	11117.0	9129.0	18232.0	25052.0	41806.0
Portugal	Q:	3.9	8.4	8.6	12.8	10.7	8.6	-
	V:	2195.0	4333.0	4098.0	6532.0	5775.0	4966.0	-
Norway	Q:	0.9	0.7	0.7	0.8	0.8	1.0	0.9
	V:	580.0	436.0	491.0	522.0	557.0	637.0	590.0
Morocco	Q:	5.2	5.9	5.5	2.2	5.5	4.2	5.5
	V:	1555.0	1441.0	1437.0	541.0	1373.0	1114.0	1371.0
USA	Q:	1.8	2.2	3.9	1.0	0.5	0.2	0.1
	V:	581.0	39.1	52.0	43.0	71.4	81.0	66.0
Total incl. Others	Q:	21.7	39.1	52.0	43.0	71.4	81.0	123.8
	V:	8411.0	14086.0	18283.0	17125.0	26143.0	30771.0	44096.0

3/ Source: Yearbook of Fishery Statistics, FAO, 1968.

Table F-4

Exports of Frozen Mackerel[4/]
by Major Countries

Country		1961	1963	1964	1965	1966	1967	1968	% of total in 1968
Norway	Q:	2.6	4.8	2.7	6.0	4.3	5.2	10.0	69.4
	V:	387.0	787.0	440.0	964.0	756.0	914.0	1794.0	
Canada	Q:	0.2	0.6	0.4	0.6	0.3	0.8	1.0	6.9
	V:	60.0	147.0	83.0	130.0	67.0	180.0	208.0	
Japan	Q:	0.5	2.4	3.0	3.1	2.2	3.3	3.0	
	V:	86.0	350.0	437.0	567.0	397.0	594.0	572.0	
Total	Q:	3.3	7.8	6.1	9.7	6.8	9.3	14.4	
	V:	533.0	1284.0	960.0	1661.0	1220.0	1688.0	2574.0	

4/ Source: Yearbook of Fishery Statistics, FAO, 1968.

Direction of Exports. Philippines, Italy, Belgium and USA constitute the major consumers of canned mackerel. The offtake of these countries is more than 50 per cent. Approximately 60 per cent of Japan's export is destined to Philippines, while Italy is the major market for France and Portugal; USA and Czechoslovakia are the important customers of frozen mackerel.

In India, about 20 per cent of the catch is salt cured on pickled and approximately 5 per cent is canned. A negligible portion of the salt cured mackerel is exported to Ceylon and Far East while canned mackerel is entirely sold within the country for civilian and defence requirements. The remaining portion (75 per cent) is consumed in fresh form in the country. Sometimes unsold mackerels are beach dried and then converted to manure for use in coconut, coffee and tea plantations.

Prospects

There is considerable potential for the export of canned mackerel in the world markets and this trend is likely to continue in the future. India's export of this item has been practically nil. In view of the large market potential and the abundant resources available for the supply of mackerel, it should be possible for India to

develop an export trade of 100 tonnes of canned mackerel by 1973-74 and eventually to reach the target of 5,854 tonnes by 1978-79 enabling the country to earn foreign exchange worth Rs 27.14 million. The countries that offer promise for the export of this item are Poland, UK, Libya, Sudan and East Germany. The market-wise export projections of canned mackerel by 1973-74 and 1978-79 are indicated below:

Table F-5: Export Projections for Canned Mackerel

	1973-74		1978-79	
	Qty (Tonnes)	Val (Rs million)	Qty (Tonnes)	Val (Rs million)
Poland	25	0.10	1,200	5.6
UK	20	0.08	1,000	4.6
Libya	15	0.06	900	4.2
Sudan	10	0.04	850	3.9
East Germany	10	0.04	800	3.7
Others	20	0.08	1,104	5.1
Total	100	0.40	5,854	27.1

With a view to developing this fishery to reach the target envisaged above, fishing operations will have to be organised by the use of purse-seiners in the regions off Kerala, Mysore, Goa and Maharashtra on a large scale. The results of pelagic fishery project proposed with the UNDP assistance will be of considerable benefit to increase the range and duration of fishing operations.

1.7 Eel

Background

Eel, belonging to the family of Muraenesecidae is a bottom fish. It is found mainly in the Indo-Pacific ocean. Japan, India, Hong Kong, China (Taiwan) and South Korea are the major eel producing countries of the world. The fish is, however, also caught in small quantities in Netherlands, Denamrk and Sweden.

Species

In India, eels are found all along the coasts and the two major species are Muraenosox cinereus and Muraenosox talabonoides. The commercial catches of the fish range in length from 120 cm to 170 cm. Muraenosox talabonoides, which is locally known as "Wam" is available in large quantities on the north west coast during the months of August-October.

Landings

Table G-1 shows the landings of eels in selected countries.

Table G-1

Landings of Eels in Selected Countries

(Thousand tonnes)

Country	1961	1963	1964	1965	1966	1967	1968	% of total in 1968
Japan	33.7	32.8	28.4	29.3	32.7	26.8	24.0	53.3
India	11.4	8.7	2.2	2.4	2.4	2.5	3.4	7.6
Hong Kong	2.6	2.5	2.8	3.2	3.5	3.4	3.9	8.7
China (Taiwan)	3.9	3.3	4.5	4.7	4.2	4.5	4.8	10.7
South Korea	1.0	1.6	1.6	1.0	2.7	2.8	8.3	18.4
Total incl. others	53.0	50.0	40.0	42.0	46.0	41.0	45.0	100.00

Trends in Landings. In the world landings of eels, there has been a gradual decline in recent years. Eel landings declined from 53,000 tonnes in 1961 to 45,000 tonnes in 1968 registering a fall of 15 per cent. Japan, which is the leading eel producing country in the world accounted for more than 53 per cent of the world landings in 1968, when its landings were only 24,000 tonnes as against 33,700 tonnes in 1961. Eel landings in India also evinced considerable decline between 1961 and 1968. India, which ranked second in the total world production of eels in 1961 came to occupy the fifth position in 1968, when its

1/ Source: Yearbook of Fishery Statistics, FAO, 1968.

landings were only 3,400 tonnes as against 11,400 tonnes achieved in 1961. On the other hand Korea's landings increased from a low base of 1,000 tonnes in 1961 to 8,300 tonnes in 1968. Landings of the fish in Hong Kong and China (Taiwan) also showed marginal increase.

Landings in Maritime States of India. At present, the eel catch in India constitutes a very small portion of the country's marine fish landings. The bulk of the catch is from the coasts of Maharashtra and Gujarat. Maharashtra dominates the catch with a share of 71 per cent of the total eel landings. Gujarat and Andhra Pradesh are the other eel producing States in India contributing together about 24 per cent of the total landings. Maharashtra's landings declined sharply from 9,785 tonnes in 1961 to 1,814 tonnes in 1965 but have picked up to 2,454 tonnes in 1968. Table G-2 presents state-wise landings of eels since 1961.

Table G-2

Statewise Landings of Eels[2/]

(in tonnes)

	1961	1965	1966	1967	1968
Andhra Pradesh	959	390	195	191	420
Gujarat	194	75	49	47	398
Maharashtra	9,785	1,814	2,077	1,839	2,454
Tamil Nadu	123	38	73	95	137
Total	11,380	2,473	2,426	2,578	3,422

2/ Central Marine Fisheries Research Institute, Mandapam Camp.

Exports

Eels do not figure prominently in the international trade of fishery commodities. A very insignificant portion of the catch enters the export trade in canned, frozen and smoked forms. The fish is mainly domestic market oriented. Detailed information about the world trade of the fish is not available. However, it is understood that a negligible quantity of the fish is exported from Netherlands and Denmark to UK and West Germany.

So far there have not been any export sales of eels from India. The entire catch is consumed in the domestic market mainly in the fresh and dried forms. The air bladders from eels are dried and exported as fishmaws.

Prospects

No effort has so far been made to export eels from India. India is in a position to export considerable quantities of smoked and canned eels in view of the larger eel fishery along the north west coast. Particular attention should be

devoted for increasing the catch and for setting up canning facilities at important landing centres. It has been recommended elsewhere that the proposed canning factories at Bombay and Veraval should take up canning of eels also. Simultaneously market studies should be conducted in some of the continental countries and USA for a long term programme. It is reported that trial consignments of eels, smoked and canned, have been received will in Denmark, West Germany, USA and Poland.

If concentrated efforts are made on the production and export of eels as indicated above, it is estimated that India can achieve an export of 100 tonnes valued at Rs 1.00 million by 1973-74 and 1,200 tonnes valued at Rs 13.08 million by 1978-79. The marketwise export - projections of canned eel is shown in the table below:

Table G-3 : Export Projection for Canned Eels

Country	1973-74		1978-79	
	Qty (Tonnes)	Val (Rs million)	Qty (Tonnes)	Val (Rs million)
Denmark	25	0.25	260	2.7
Poland	20	0.20	240	2.6
West Germany	15	0.15	230	2.5
Sweden	13	0.13	150	1.6

(Contd..)

Table G-3 (Contd.)

	1973-74		1978-79	
	Qty (Tonnes)	Val (Rs million)	Qty (Tonnes)	Val (Rs million)
USA	12	0.12	120	1.4
Japan	12	0.12	130	1.4
Others	3	0.03	70	0.8
Total	100	1.00	1,200	13.0

1.8 Frozen Fish

(Pomfret, Seer Fish and Perches)

Background

Although a wide variety of commercial fishes are landed in India, no organised attempt has so far been made for processing them on a large scale. The possibilities offered by a few selected varieties of fish for processing them for export are discussed in the following paragraphs.

A. Pomfrets

Pomfrets are found in abundant quantities in the Indian seas though small quantities are also caught in the seas off Cambodia and Thailand. Pomfrets constitute a little over 3 per cent of the total marine fish landings in India. It is an important fishery of great commercial value and is found in large quantities off Maharashtra and Gujarat coasts.

Species

Pomfrets in India occur in three species. Chondroplites Chinensis enjoys a wide distribution in the Indo-Pacific region. This species is abundant in the coastal waters when it migrates to spawn. The fishing season in West Bengal, Maharashtra and Gujarat is March to June and along the coasts of Kerala from June to September. This species also occurs along the coast of Orissa, Andhra Pradesh, Tamil Nadu and Mysore.

The black pomfret, Formio niger, is the only member of the family Formonidae found in the Indian waters. Though this species is present all along the coast of India, the fishery is concentrated mainly along the coasts of Gujarat and Maharashtra. A fishery of this species also exists along the coasts of Orissa and West Bengal.

The grey or silver pomfret, Stromateus argenteus are caught mainly in the juvenile stage along the coast of West Bengal in large quantities. A small quantity of this variety is caught along the coasts of Saurashtra, Orissa and Andhra Pradesh.

Landings

Landings of pomfret in India along with its position in relation to all marine fish landings is shown in Table H-1.

Table H-1

Landings of Pomfret in India 1/

(Tonnes)

Year	Pomfret	All Marine Fish	% Share
1961	16,417	683,569	2.4
1963	17,256	655,484	2.6
1964	19,580	859,852	2.3
1965	17,662	832,777	2.1
1966	17,703	890,311	2.0
1967	27,373	890,888	3.2
1968	28,206	932,765	3.1

Trends in Landings. It may be seen that there has been a moderate increase in the landings from 16,417 tonnes in 1961 to 28,206 tonnes in 1968, indicating an increase of 27.3 per cent. The increase in landings has, however, been punctuated by occasional setbacks during the intervening years. These fluctuations are ascribed to the seasonal nature of the fishery.

Landing in Maritime States of India. Pomfret is found in the States of Maharashtra and Gujarat on the west coast and Tamil Nadu, Andhra Pradesh, Orissa and West Bengal on the east coast. (See Table H-2).

1/ Source: Central Marine Fisheries Research Institute, Mandapam Camp.

Table H-2

State-wise Landings of Pomfrets[2/] in India

(Tonnes)

State	1961	1962	1963	1964	1965	1966	1967	1968
Gujarat	6,106	5,519	7,264	7,165	6,680	6,081	5,676	5,781
Tamil Nadu	2,038	2,499	2,026	1,529	1,202	1,107	1,903	2,272
Andhra Pradesh	1,460	3,759	2,294	3,337	2,334	1,847	2,355	4,308
Maharashtra	5,818	4,006	3,852	5,983	6,531	7,784	15,010	10,792
Total incl. others	16,417	25,607	17,216	19,575	17,662	17,703	27,371	28,206

Source: 2/ : Central Marine Fisheries Research Institute, Mandapam Camp.

Maharashtra dominates the landings of pomfrets in India with its share of 38.2 per cent of the total landings in 1968. Its landings increased from 5,818 tonnes in 1961 to 10,792 tonnes indicating an increase of 85.4 per cent. Maharashtra is followed by Gujarat contributing 20.4 per cent to the total landings. Tamil Nadu and Andhra Pradesh on the east coast contribute an additional 23.3 per cent to the total landings of pomfret.

Exports

At present pomfret is mostly marketed internally in fresh form, as the price in the domestic market is very attractive. Only in recent years, efforts have been made to exploit the export potential of this fish. Attempts have been made to consign limited quantities of the fish in frozen whole form to Japan and fillets to USA. No separate statistics are available regarding exports of pomfrets. It is however reported that during 1967-68, its exports were roughly about 1.5 tonnes, valued at Rs 15,000.

B. Seer Fish

Species

Seer fish belonging to the genus, Scomberomorous is distributed throughout the tropical and sub-tropical seas. The fish occurs in three major species viz.

Scomberomorous commersonii, Scomberomorous guttatus and Scomberomorous lineolatus. Bulk of the fishing takes place in the Pacific off the Japanese coast and in the Indian Ocean. The fish is also comparatively abundant along the Atlantic coast of the United States and in the Gulf of Mexico.

Seer fish attains maximum weight of about 4 to 5 kgs and varies in length from 42 cm to 156 cm. These are caught by troll lines, gillnets and pound nets.

Landings

Table H-3 gives the landings of seer fish since 1961.

Trends in Landings. World production of seer fish has shown an impressive rise during the last decade. Between 1961 and 1968, world landings of seer fish rose from 43,000 tonnes to 84,000 tonnes or at an average annual gtowth rate of 10 per cent over the period. Japan dominates the world production of the fish with a share of about 24 per cant. Its landings increased significantly from 3,100 tonnes in 1961 to 20,000 tonnes in 1968. India ranks second in the total production of the fish contributing 15.4 per cent to the total landings. Other major producing countries, namely, Mexico, Venezuela and

Table H-3

Landings of Seer Fish[3/] in India

(Thousand tonnes)

Country	1961	1963	1964	1965	1966	1967	1968	% of total in 1968
Mexico	3.9	4.6	4.9	5.7	6.2	7.0	7.8	9.5
Venezuela	3.5	3.3	4.2	3.3	3.5	3.1	2.8	3.8
India	11.5	9.1	11.2	9.4	9.9	7.0	13.1	15.4
Japan	3.1	3.6	5.0	5.8	6.6	7.0	20.0	23.8
Malaysia	5.1	5.0	5.4	1.8	7.6	6.2	6.9	8.3
Total incl. others	43.0	44.0	52.0	55.0	59.0	63.0	84.0	100.0

3/: Source: Yearbook of Fishery Statistics, FAO, 1968.

Malaysia had a combined share of more than 12 per cent in the world landings.

Landings in Maritime States of India. The landings of seer fish constitute approximately 9 per cent of the total marine fish landings in India. Though the fish is caught all along the Indian coast, the bulk of the catch is obtained off the coasts of Tamil Nadu and Andhra Pradesh. It is also landed extensively in Maharashtra and Gujarat. Table H-4 gives the state-wise landings of seer fish in India.

It may be seen from the Table H-4 that there has been a substantial increase in the landings from 11,439 tonnes in1961 to 13,156 tonnes in 1968 or at an average annual growth rate of 2 per cent. Tamil Nadu and Andhra Pradesh together contributed 48 per cent of the total landings of the fish in India. The landings of the fish in Tamil Nadu, the leading producing State in India, however, fell by about 19 per cent the actual quantity being 4,345 tonnes in 1961 and 3,525 tonnes in 1968.

Exports

Seer fish is at present consumed mainly in fresh forms. Statistics regarding world trade of the fish are not available. However Japan and Mexico are understood to be the major exporters of the fish.

Table H-4

State-wise Landings of Seerfish in India 4/

(Tonnes)

State	1961	1962	1963	1964	1965	1966	1967	1968
Tamil Nadu	4,345	3,955	2,720	3,129	2,418	3,589	3,624	3,525
Andhra Pradesh	2,801	4,347	2,998	3,152	2,589	2,762	2,206	2,792
Maharashtra	490	458	625	1,985	1,635	1,195	1,018	1,065
Mysore	250	234	433	427	163	171	285	747
Gujarat	457	248	586	280	643	865	899	843
Total incl. others	11,439	10,913	9,091	11,135	9,385	9,976	7,090	13,156

Source: 4/ : Central Marine Fisheries Research Institute, Mandapam Camp.

Though India is one of the major seer producing countries of the world, there is hardly any export of the fish except small quantities in filleted form sent intermittently to USA, Singapore and Japan. Most of the landings are consumed locally in fresh form.

C. Perches

Background

Perches are found in the Indo-Pacific and Atlantic oceans, Persian Gulf and Caribbean seas. Australia, Canada, West Indies and Japan are the major producers of this fish. It is, however, also caught in small quantities in India. Information on the landing of perches in various countries is not available.

Species

In India the fish occurs in two major species viz. Lates calcarifer, and Epinep helidae. The giant perch, Lates calcarifer, is a large sized fish, distributed all along the coast of India and in the estuaries. The species is considered to be a good game fish and is esteemed as a food fish. It attains a length of 152 cm. and the commercial catches are between 45 cm and 61 cm. The average weight of the fish is 227 gm. This species is easily adaptable

to fresh water ponds and tanks. The giant perch offers good scope for brackish water pond culture along the enclosed swamps of the coastal areas. The Rock perches are members of the family Epinephelidae.

Landings

The landings of Perch in India are at present very small. The catch of 10,425 tonnes in 1968, contributed 1.1 per cent to the total marine fish landings in India. Landings of the fish declined by about 30 per cent during 1961-68 from 14,826 tonnes to 10,425 tonnes. The landings of perches in India during 1961-68, are given in Table H-5

Table H-5

Landings of Perches in India 5/

Year	Perches	All Marine Fish	Percentage share
1961	14,826	683.569	2.2
1962	8,578	644,244	1.3
1963	8,284	655,484	1.3
1964	13,477	859,582	1.4
1965	7,962	832,777	0.9
1966	11,844	890,311	1.3
1967	8,120	891,888	0.9
1968	10,425	932,765	1.9

5/ Source: Central Marine Fisheries Research Institute, Mandapam Camp.

Landings in Maritime States of India. Landings of perches are heavy in the State of Tamil Nadu alone contributing 67.3 per cent to the total landings of perches in India in 1968, while Kerala's share was 15.8 per cent. The State-wise break-up of perch landings in India is shown in the following table.

Table H-6

Statewise Landings of Perches[6/] in India

(Tonnes)

State	1961	1962	1963	1964	1965	1966	1967	1968
Kerala	1,283	892	792	763	646	1,259	1,619	1,649
Gujarat	184	118	52	65	47	169	172	226
Tamil Nadu	8,984	3,196	4,233	4,101	3,905	6,600	4,781	7,024
Andhra Pradesh	1,250	1,215	1,049	2,678	2,296	1,151	1,049	592
Total incl. others	14,826	8,578	8,284	12,477	7,982	11,844	8,120	10,425

Exports

World trade in perches takes place only in frozen form either whole or in fillets. Canada is the leading exporting country followed by Australia. In 1968, Canada shipped

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6/ Source: Central Marine Fisheries Research Institute, Mandapam Camp.

about 23,000 tonnes of frozen perch valued at $ 11.7 million. Almost the entire consignment was exported to the US market.

Except for a very negligible quantity in frozen form, perches do not figure in the export trade of India.

Prospects

Although India has the requisite resource base, exports of fishes like pomfrets, seer and perches have been relatively insignificant. These fishes offer considerable scope for exports as frozen, fillets or whole. One of the main drawbacks for which it has not been able to process and export these fishes is the lack of freezing facilities at important landing centres. The prime requisite for developing this trade therefore is to establish a few freezing units at important landing centres equipped with modern beheading and filleting machines.

It is learnt that foreign visitors to India have expressed satisfaction in consuming these fishes in the country, especially pomfret which compares very well with pompano in the United States. It is expected that these fishes will command good consumer preference in the American and European markets. It would however be necessary to

popularise them in these markets, if necessary, by arranging special demonstration. Besides, necessary steps would also have to be taken for meeting the foreign market requirements in respect of quality, grade standards, packaging and delivery schedules. In view of the high quality of the fishes, it is felt that pomfrets, perches and seer could be marketed effectively as frozen whole and fillets in countries like UK, USA Scandinavia, Singapore, West Germany and Japan. If these markets are tapped effectively it is envisaged that an export trade of 100 tonnes can be achieved by 1973-74 and target of 23,230 tonnes by 1978-79 to earn foreign exchange worth Rs 68.69 million. The market-wise export projections of these items in the fourth and fifth plans are given below:

Table H-7 : Export Projections for Frozen Fish

Country	1973-74		1978.79	
	Qty (Tonnes)	Val (Rs million)	Qty (Tonnes)	Val (Rs million)
USA	15	0.13	4,110	12.5
Japan	25	0.22	6,930	20.8
UK	14	0.13	3,880	11.6
Scandinavia	13	0.12	3,610	11.2
Singapore	10	0.09	2,770	8.5
West Germany	9	0.08	2,490	7.5
East European Countries	10	0.09	2,780	8.5
Others	4	0.04	1,160	2.7
Total	100	0.90	27,730	83.1

1.9 Crab

Species

Crabs are decapod crustacea belonging to the family Brachyura. These occur in a number of species in the tropical regions of the world. However, species which are important from commercial point of view are the Blue crab (Callinectes sapidus), Dungeness crab (Cancer magister), Alaskan King Crab (Paralithodes Camtschatica) and Rock crab (Cancer irroratus).

BLue crab which is by far the most important species is found mainly on the Atlantic coast from Massachusetts to Texas, and is particularly abundant in Chesapeake Bay and certain points of the Gulf coast. The next most important species is the Dungeness crab which is found on the Pacific coast of North America. The Alaskan King crab occurs in the Bering sea and in the coastal waters and bays in the Alaska peninsula and the Gulf of Alaska. These are very large crabs. The rock crab is the common crab of the New England coast. This species is not, however, utilised commercially to a great extent. In India the most familiar species is similar to the King crab and is found all along its coasts during August to October.

This species occurs in the entire Indo-Pacific region on the coasts of Japan, China (Taiwan), South Korea and Malaysia.

Crab Harvesting

The gear used for crab catching varies from species to species and from country to country. The blue crab is caught by pots, trawl lines, scrapes and dredges. The crab pot functions very much as the lobster pot, though constructed of wire mesh instead of lathes. Trawl lines are made of a long rope to which are attached at intervals of about 18 inches, snoods, which hold the bait. A boat, moving along the line, lifts it and the crabs cling to the bait till they are free of the water, then they drop into a dip net. Scrapes and dredges are towed along the bottom by boats; they are hauled in at intervals, and the crabs are dumped on deck. After the catch is culled, the crabs are shovelled into barrels and then brought to the processing plants.

King crabs are caught in Japan in tangle nets which measure about 150 feet in length and ten or nine feet in depth. The net is anchored at each end, and owing to glass buoys and lead sinkers attached to it, hangs loosely near the bottom. The crabs become entangled in the mesh, the

net is lifted at intervals and the crabs are removed by hand. Crabs arecaught in USA mainly by otter trawl while large pots are used for king crab fishing in some of the inshore waters in Alaska. In India crabs are caught by using seine nets, dip nets, cast nets, lines, hooked iron rods and the crab net.

Landings

Trends in Landings. World catch of crab has shown an impressive rise btween 1961 and 1968 shown in Table I-1 World catch of crabs has increased from 237,000 tonnes in 1961 to 354,000 tonnes in 1968, or at average annual growth rate of 5.9 per cent

USA is the leading producer of crabs followed by Japan. In 1968 USA accounted for about 31 per cent of the total catch, virtually monopolising the entire catch of blue crab and dungeness crab. USSR and Japan are the major producers of king crab. Other major crab producing countries are Thailand, China (Taiwan), France, Malaysia, South Korea, Mexico and Spain. Compared to these countries, India is only a fringe producer of crabs. Statistical information regarding crab catch in India is not available.

Table I-1

Catches of Crabs by Countries[1/]

(Thousand tonnes)

Species/ Country	1961	1964	1965	1966	1967	1968
A. Blue Crab						
USA	69.3	71.3	77.6	77.1	67.5	50.6
Total incl. others	69.3	71.3	78.0	77.1	68.0	51.0
B. Dungeness Crab						
USA	14.8	10.5	13.1	18.0	19.3	20.0
Canada	2.1	2.0	1.6	2.0	2.4	2.0
Total incl. others	17.0	13.0	15.0	20.0	22.0	22.0
C. King Crab						
USSR	38.7	46.2	44.4	46.0	42.3	40.4
USA	19.7	39.3	59.7	72.3	57.9	38.6
Japan	27.8	31.8	25.9	31.0	30.0	30.0
Total incl. others	88.0	117.0	130	150.0	131.0	112.0
D. Other Marine Crab						
Japan	35.4	41.9	37.7	40.7	55.9	88.0
Thailand	N.A.	9.2	11.0	13.3	13.3	24.2
China (Taiwan)	1.0	1.5	1.8	2.3	3.2	3.9
Total incl. others	63.0	87.0	87.0	111.0	120.0	169.0
Grand Total	237.0	288.0	310.0	344.0	341.0	354.0

1/ Source: Yearbook of Fishery Statistics, FAO, 1968.

Processing

In the preparation of the meat of the blue crab, the crab is first cooked by steam of boiling water, the meat is then picked from the shell by hand. The claw meat which is darker in colour, is kept separate from the light-coloured body meat. During picking, the body meat is further separated into grades such as white flake, backfin, mixed and other designations, which signify to a degree, the size of the pieces of meat within a particular grade. The various grades of meat are generally packed in 1-pound cans. Blue crab in frozen form is not considered to be very satisfactory from the standpoint of quality, as it rapidly becomes spongy and fibrous in texture and loses the delicate characteristic flavour of the fresh product. The frozen storage life is generally considered to be not more than one month.

The dungeness crab is prepared in the same manner as the blue crab, except that the meat from all parts of the crab is generally combined into one grade. The body meat and leg meat are sometimes separated in layers in the same can. This meat is packed in waxed fibre board cartons and metal cans of $\frac{1}{2}$, 1 and 5 pound capacity.

King crab meat is much more suitable for freezing than is the meat of other species of crab. Cooked king crabs are frozen in the shell, and can be stored for a period upto 6 months without marked changes in flavour and texture.

Exports

Of the total trade in crabs, 95 per cent is accounted for by canned crab meat, while the remaining 5 per cent is exported as frozen. World exports of canned crab meat increased from 7,700 tonnes (valued at $ 19.9 million) in 1961 to 14,000 tonnes (valued at $ 23.9 million) in 1968 or at an average annual growth rate of 8.9 per cent. Japan is the leading exporter of canned crab meat contributing 35.3 per cent to the total export of the product. In 1968, Japan's exports amounted to 4,800 tonnes (valued at $ 15.1 million). USSR ranks second in the exports of canned crab meat. In 1968 its exports were of the order 4,700 tonnes (valued at $ 16.1 million) Other important exporters include USA(2,000 tonnes) and Norway (1,700 tonnes). Table I - 2 presents world exports of this item by major countries.

Table I-2

Exports of Canned Crab Meat[2/]
by Major Countries

Qty: Thousand tonnes
Val: Thousand US dollars

Country		1961	1963	1964	1965	1966	1967	1968
USSR	Q	3.7	5.0	5.3	4.9	4.8	5.0	7.7
	V	9,435	11,592	11,967	11,652	12,554	14,528	16,143
Japan	Q	3.3	3.2	4.1	3.8	3.1	2.6	4.8
	V	9,778	9,412	11,550	11,448	9,961	8,820	15,128
Norway	Q	0.7	0.6	0.8	0.8	0.6	0.4	1.7
	V	734	622	862	982	787	568	4,777
Total	Q	7.7	8.8	10.2	9.5	8.5	8.0	11.2
	V	19,947	21,627	24,379	24,074	23,302	23,916	36,048

Direction of Exports. UK, USA, France, Sweden and Belgium constitute the major consuming markets for canned crab meat, accounting for over 75 per cent of the world imports. UK alone absorbs over one-fifth of the world imports.

A negligible quanity of frozen and salted crab meat enters into the export market from Norway, Malaysia and Cambodia.

Crab Fishery in Selected Countries

Crab fishery in selected counteis is briefly reviewed below:

USA. USA accounts for 31 per cent of the total world catch of crabs. Virtually, the entire catch of blue and dungeness crab takes place in USA. Besides, USA contributes about 35

2/ Source: Yearbook of Fishery Statistics, 1968, FAO.

per cent of the total catch of King crabs. The Atlantic and Gulf catch of Blue crab was 109.5 million pounds in 1968 - 35.5 million pounds less than the level reached in 1967 and 31 per cent below the 1962-66 average of 159.8 million pounds. Despite the decline in catch in 1968 the average prices paid to fishermen were 66 per cent higher, and the total realisation was $ 2.2 million more than in 1967. The catch of Pacific Dungeness crab in 1968 was 44 million pounds. Landings were 57 per cent above the 1962-66 average of 28 million pounds and the average price paid to the fishermen was 20 per cent higher than in 1967. A sharp decline in the King Crab catch helped to create a healthy market for this variety of crab.

The landings of Alaskan King crab increased from 9 million pounds in 1956 to a peak of 159.3 million pounds in 1966. The catch dropped to 127.7 million pounds in 1967 and further decreased to 85.0 million pounds in 1968. The catch from the Kodiak area fell sharply and landings from other areas in South Peninsula and Aleutian Island were not at large as in previous years. Late in 1968 ex-vessel price for the scarce king crabs soared to 45.- 48 cents per pound - over three times

the contract price of 12 cents per pound. The shortage of king crabs has created interest in the canners of snow crabs, a species known to be plentiful in Alaskan waters. Production of this species may increase when King crab fishing will come under control by the Alaska Board of Fish and Game.

Japan. Crabs occur in Japan mainly in the Bering and Okhotak seas. These are fished by operating factory ships in the Eastern and Western waters of Bering sea and in the western coast of Kamchatka by using bottom gill nets. The crabs caught are immediately taken on board the factory ship to be canned. The entire fishing is organised by seven mother ships and 99 attached boats, 67 boats of which are carrier boats of about 10 tonnes. The total catch of crabs in 1968 was 118,000 tonnes, the major part of which was constituted by King Crab.

The crab fishing in the Western coastal waters of Kamchatka as in the case of Salmon fishing is regulated by the Japanese - USSR fisheries convention regarding the amounts of catch and sizes of meshes. The fishing in the Bering sea is operated under the provisions of the International convention for High Seas Fisheries of the North Pacific Ocean (Canada, Japan and USA Fisheries Convention).

Japan's export of canned crab meat in 1967 was 1,100 tonnes valued at $ 2,595,000. The major importing countries for Japanese crab meat are UK and France.

Prospects

Although crab occurs in large quantities all along the Indian coasts and in back waters, like Chilka Lake and Pulicat Lake, it has not yet developed into an exclusive fishery as no organised effort has so far been put forth for the collection and commercial exploitation of the crabs. The present negligible catch is consumed locally by the people living in the coastal areas. Efforts should be intensifed by introducing suitable techniques all along the Indian coast for collecting and processing them for export. In view of the availability of good quality crabs in Chilka Lake it is proposed that a processing unit equipped with freezing and canning facilities may be set up at Balugaon near Chilka Lake in Orissa for processing crabs and shrimps. It is reported that the crab found in Chilka Lake is as tasty as the king crab, and can have a very good market in the USA, Scandinavia, France and UK. While exporting crab meat measures should be taken to see that the claw-meat is separately processed from the body meat, as the former has a higher price advantage than the latter.

1.10 Oyster

Species

Oyster which belongs to the Bivalvia class of Mollusc fisheries occupies an important place among the food resources of the sea. The commercially important species of oyster are eastern oyster (Crassostrea virginical), olympia or native oyster (Ostrea lurida) and Pacific oyster (Crassostrea gigas). Eastern oyster is of primary importance because of its wide distribution and great abundance. This species thrives in the coastal waters of USA and in the bay from Massachussetts to Texas. Species which are found on Pacific coast of USA are the olympia oyster and the Pacific oyster. The olympia is a very small oyster, averaging 2,000 or more to a gallon; its habitant extends from British Columbia to California. Pacific oyster, introduced by Japan, is a very large species.

The species which are found along the Indian coasts are the Indian backwater oyster (Crassostrea madrasensis); the rock oyster (Crassostrea cucullata) and disc oyster, (Crassostrea discoidea). Backwater oyster is abundant in India and is found in the backwaters and

estuaries of the east coast and Kerala. Rock oyster is distributed in the inter tidal region of the rocky coasts. Disc oyster (c. discoides) is distributed in the littoral zone of the coastal area of Gujarat, Maharashtra and Mysore.

Methods of Harvesting

Oysters are harvested by dredging, tonging or picking. The particular method employed varies considerably with the geographical location of the oyster beds.

On the east coast of USA and in the Gulf of Mexico, most of the oysters are harvested by dredgers. These are dragged over the bottom at the end of a tow line from a boat, and the oysters are collected in a mesh bag made of chain or heavy rope attached to the rear of the dredge. When the dredge is filled, it is lifted aboard the boat by a winch, and the oysters are dumped on deck.

Tonging is done in relatively shallow waters, usually where the oysters are more scattered or are in small beds. Tongs are long scissor shapped tools, upto 20 feet or more in length, with iron baskets fitting together at one end. The fisherman working from a small boat, grabs the bottom until a number of oysters have been gathered into

the basket. The tongs are then lifted and the oysters are dumped on the boat.

On the pacific coast, tonging is practically obsolete. Oysters are harvested by dredging and by picking. Picking, is done while walking over the surface of the beds when the tide is out.

Landings

USA (Pacific) and Japan are the major oyster producing countries of the world accounting for about 80 per cent of the total production. South Korea, Mexico and Australia contribute together 15 per cent. The following table gives catches of oysters by major countries of the world.

Table J-1

World Catch of Oysters[1/]

(Thousand tonnes)

Country	1961	1963	1964	1965	1966	1967	1968	% share of total in 1968
USA	402.6	395.0	414.5	350.9	356.4	415.3	388.7	47.2
Japan	172.9	240.1	240.6	210.6	221.1	232.2	267.5	32.5
France	87.1	70.3	62.2	65.8	62.3	69.5	44.7	5.4
South Korea	14.7	56.8	42.6	45.9	51.7	44.4	38.2	4.6
Mexico	19.2	19.8	24.0	29.6	25.1	28.4	35.5	4.3
Australia	6.5	5.9	5.8	6.6	6.8	7.3	7.6	0.9
Total incl. others	731.0	815.0	829.0	741.0	761.0	839.0	823.0	100.0

1/ Source: Yearbook of Fishery Statistics, FAO, 1968.

Trends in Landings. World oyster production evinced a marginal rise of 12.5 per cent between 1961 and 1968. It increased from 731,000 tonnes in 1961 to 823,000 tonnes in 1968. Though there was a slight decline in the production of USA between 1961 and 1968, it continued to be the largest producer of oysters contributing more than 47 per cent to the world production. Japan which ranks second in the world oyster production showed an increase of nearly 55 per cent during 1961 to 1968 when its production increased from 173,900 tonnes to 267,500 tonnes. Mexico's production of oyster showed a sharp increase from 19,200 tonnes to 35,500 tonnes representing an increase of about 85 per cent. Statistical information about oyster catch in India is not available.

Culture of Oyster

Oysters offer excellent opportunity for large scale culture under controlled conditions. Oyster-cultivation is practised in three different ways: (i) sowing (ii) sticking (iii) hanging. In the first method seed oysters settle on small stones or shells sown in selected areas which are then protected with the help of bamboo poles and mats. In the second method, sticks or stones on which oyster spats settle are heaped together at different places and then

harvested after three or four years. These two methods are not now very popular and the yield is very small. They are followed in shallow areas which do not lend themselves to better methods of production. The third type viz. hanging method is now more widely practised. In this method, spat is collected by hanging strings of thin oyster shells vertically apart. After the spat settles on the shells the latter are removed and hung again, about 6" apart on galvanised iron wire, each shell being kept apart by tabular bamboo pieces. The distance between the two shells provides space for growth of oyster spat already settled in the shells. The strings of shells having seed oyster are then hung vertically below a floating raft or looped in festoon fashion from ropes stretched between rows of vertical bamboo stakes or poles fixed on the bottom of shallow backwaters. The raft system has proved to be more effective than the stake system as in the former system seed oysters are better exposed to the current of water bringing food to the oyster thereby permitting faster growth. Moreover, in this system the oysters are never exposed to sun and air even during low tides. The spat collections are usually fixed in the month of July and August when the temperature

of water is between 25° to 22°C and the seed oysters are allowed to grow till about September.

Japan is the leading country in the world which has developed large scale oyster culture. It is understood that there are about 8,000 oyster culture managements in the country, located mainly in Hiroshima, Saga, Miyagi and Iwate.

Exports

International trade of oysters takes place both in frozen and canned form. Out of the total exports of 17,500 tonnes (valued at $ 11.1 million) in 1968, 68 per cent comprised frozen oysters and 32 per cent canned. In 1968, exports of frozen oysters amounted to 11,900 tonnes (valued at $ 4.8 million) as compared to 4,900 tonnes (valued at $ 2.4 million) in 1961; thereby witnessing an average annual growth rate of 13.5 per cent. Portugal is the leading exporter of frozen oysters accounting for 86.5 per cent, followed by Netherlands (1,200 tonnes), Japan, and Canada (400 tonnes). World exports of frozen oyster since 1961 are shown in Table J-2.

Table J-2

World Exports of Frozen Cysters 2/

Qty: Thousand tonnes
Val: Thousand US dollars

Country		1961	1963	1964	1965	1966	1967	1968	% of total in 1968
Canada	Q:	0.2	0.2	0.2	0.2	0.2	0.2	0.4	3.4
	V:	79.0	73.0	54.0	79.0	90.0	75.0	214.0	
USA	Q:	0.3	0.1	0.2	-	-	-	-	
	V:	448.0	191.0	301.0	-	-	-	-	
Japan	Q:	1.8	0.8	2.3	1.7	1.7	2.2	-	
	V:	272.0	425.0	325.0	297.0	186.0	533.0	-	
Nether-lands	Q:	2.6	0.7	0.7	0.9	0.9	0.8	1.2	10.0
	V:	1623.0	648.0	898.0	1,204.0	1,373.0	1,236.0	1,602.0	
Portugal	Q:	-	9.1	9.6	6.5	5.8	6.3	10.3	65.5
	V:	-	996.0	1,468.0	1,186.0	1,127.0	1,528.0	2,945.0	
Total	Q:	4.9	10.9	13.0	9.3	7.7	10.0	11.9	
	V:	2422.0	2,333.0	3,046.0	2,706.0	2,776.0	3,372.0	4,804.0	

2/ Source: Yearbook of Fishery Statistics, FAO, 1968.

At present the sole exporter of canned oyster is Japan. Exports of canned oysters from Japan increased from 3,500 tonnes (valued at $ 2.9 million) to 5,600 tonnes (valued at $ 6.3 million) during 1961-68 or grew at an average annual growth rate of 7 per cent.

Direction of exports. France, USA, Belgium and UK constitute the major consuming markets for frozen oysters with France alone absorbing 64 per cent of the total exports. Canned oysters are marketed mainly in USA and Canada, their respective shares being 81 and 9 per cent in 1968.

Prospects

Although oysters occur in large quantities in India, no effort has so far been made to process and export them. They are at present consumed mostly by the local people living along the coastal areas.

In view of the growing demand for oysters all over the world, India can acquire an appreciable share in the export trade provided efforts are made for their systematic exploitation for export to promising markets like USA, UK, Belgium and France.

1.11 Froglegs

Background

Frogs are caught in large quantities in Japan, Cuba, Mexico, Taiwan and India. Detailed statistical information on world catch of frogs is not available. Japan is, however, the leading country in the production of frogs. In India frogs are available in almost all swampy and low lying areas of Kerala, Tamil Nadu, Andhra Pradesh, Maharashtra, Assam, West Bengal and Orissa. Although several species of edible frogs are available in India, the most common species caught are the bull frog-*Rana tigrina* and R. *hexadactyla*.

Processing and Grading

Only the hind legs of the frog are used by the freezing industry and the rest of the body which contains comparatively little edible flesh is discarded. The live frogs are dipped in a 10 per cent solution of common salt, the frogs get narcotised in a short time. The hind legs are then severed from the body, skinned and washed free of blood by dipping in chlorinated water. The legs are

sorted out according to sizes into different grades on the basis of counts as follows:

Grade Designation	Counts
Jumbo	2-4 per lb.
Large	4-6 per lb.
Medium	6-8 per lb.
Small	8-12 per lb.
Extra small	12-16 per lb.
-do-	16-18 per lb.
-do-	above 20

The froglegs are also graded according to colour, if specified by the exporters. For commercial grading, the frozen froglegs usually fall into three varieties, creamy white or light-pink, brown and blue. Each individual pair or legs is wrapped in polythelene and fastened with elastic bands. These are then individually quick frozen, preferably in a blast freezer to a temperature of -40°C and packed in card board of plywood boxes. In the case of the smaller varieties, sometimes block freezing as in the case of prawns, is adopted according to the buyer's stipulation.

Exports

Japan, China (Taiwan), Cuba and Yugoslavia comprise the major exporters of frozen froglegs to the world markets.

In recent years, India has also emerged as one of the leading suppliers of this item, the main centres of processing and export being Bombay and Cochin, each contributing 50 per cent to the total exports. The following table gives country-wise exports of frozen froglegs from India since 1963.

Table K-1

Country-wise Exports of Frozen Froglegs from India 1/

Qty: Tonnes
Val: Thousand rupees

Country		1963	1964	1965	1966	1967	1968
USA	Q	416	258	277	342	514	272
	V	2,334	1,091	1,356	5,250	5,130	2,353
France	Q	94	70	164	178	197	128
	V	839	535	1,324	1,910	2,683	1,847
Belgium	Q	-	-	-	20	33	39
	V	-	-	-	250	420	552
Total (incl. others)	Q	514	332	443	557	786	452
	V	3,192	1,650	2,693	5,576	8,817	4,891

1/ Source: Marine Products Export Promotion Council, Ernakulam.

Trends in export. India has made significant progress in the export of frozen froglegs in recent years. In 1963 India's exports of froglegs were about 514 tonnes valued at Rs 3.2 million. In 1967, its exports reached an all-time peak of 786 tonnes valued at Rs 8.82 million. The export of froglegs, however, suffered a setback in 1968 when there was a drop of 42 per cent in terms of quantity and about 45 per cent in terms of value over the peak reached in 1967. In terms of unit value realisation, the value realised for a tonne of froglegs improved from Rs 6,210 per tonne in 1963 to Rs 11,232 per tonne in 1967, and Rs 10,821 in 1968.

Direction of exports. USA, and France are the principal buyers of Indian froglegs. Till 1965 their combined off-take was more than 99 per cent of India's exports. Since 1966, India has started exporting froglegs to several other countries like Belgium, Italy, West Germany, Switzerland and Australia. The share of froglegs going to countries other than USA and France has risen from 6.7 per cent in 1966 to 11.4 per cent in 1968. In terms of value, the rise is still faster i.e. from 7.4 per cent in 1966 to 14.1 per cent in 1968.

USA has been and is the single largest consumer of Indian froglegs. On account of the stiff competition offered by Japan to India, USA's share in India's exports of this item has been declining gradually from 81.1 per cent in 1963 to 60.3 per cent in 1968. In terms of quantity USA's off-take in 1967 - was of the order of 514 tonnes. This has dropped to 272 tonnes in 1968 - a 50 per cent fall. USA imports froglegs from different sources, major ones being Japan and India. During the peak year of India's exports of frozen froglegs i.e. 1967, the imports into the USA were about 1,835 tonnes, (Table K-2) of which 901 tonnes (i.e. about 50 per cent) originated from Japan and about 500 tonnes (i.e. about 27 per cent) from India, thereby placing India in the second place. Japan is thus strongly entrenched in this market and is offering a stiff competition to India. However, with the necessary improvements in the processing methods and increases in the larger size grades, it should be possible for India to enhance its exports.

Table K-2

Imports of Frozen Froglegs into USA[2/]

(in tonnes)

Source	1963	1964	1965	1966	1967	1968
India	416	258	277	342	514	272
Japan	589	708	731	796	901	798
Other countries	327	138	256	355	420	369
Total	1,332	1,104	1,264	1,493	1,835	1,439

Next to USA, France is the second largest market for Indian froglegs. Exports to France have shown a steady increase, rising from 94 tonnes in 1963 to 197 tonnes in 1967. In value terms the rise was from Rs 839,000 to Rs 2,683,000 during the same period. But towards the end of 1967 the French veterinary authorities detained certain consignments of Indian froglegs on bacteriological grounds. As a result of this, the export of this item from India suffered a temporary set back. Shipments effected during 1968 to France were only 128 tonnes as against 197 tonnes in 1967. The lacunae pointed out by the French inspection authorities were soon rectified by enforcing strict compliance with the standards and by issuing certificates indicating that goods had been inspected and were upto the requirements of the French authorities. The latest

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2/ Source: Marine Products Export Promotion Council, Ernakulam.

reports indicate that the French authorities are now fully satisfied with the quality of Indian froglegs. India is now well placed to exploit the scope for exports in the French market.

Prices

Indian froglegs fetch the lowest price in the US market as can be seen from the Table K-3 . The highest price goes to froglegs from Japan. The average price of the Indian 'Jumbo' in the US market in September 1969 was 117.5 cents per pound as against 135 cents for the Japanese product. Similarly, the 'Large' grade fetched 117.5 cents per pound for India and 142.5 cents per pound for Japan. Poor and unattractive packaging, defective grading, export of smaller size legs and defects in quality are the main causes responsible for lower unit value realisation of Indian froglegs in overseas markets. The Table over leaf gives the weekly average wholesale prices for frozen froglegs in US market.

Table K-3

Representative Wholesale Prices of Frozen Froglegs in US market (September 1969) 3/

Prices in Cents/lb.

Imported from	Grades		
	Jumbo	Large	Medium
India	117.5	117.5	122.5
Japan	135.0	142.5	149.4

Jumbo : 2-4 pairs per pound
Large : 4-6 pairs per pound
Medium: 6-8 pairs per pound

Table K-4 presents the average c.i.f. price of Indian froglegs per kg. in different markets. The lowest value realised per kg was from the US market (about Rs 9.97 per kg. in 1967 and Rs 8.63 per kg in 1968) and the highest from the French market (Rs 13.63 per kg in 1967 and Rs 14.44 in 1968). The prices realised for Indian froglegs were comparatively better in all countries other than in US. On the whole the average value of exports per kg. works out to Rs 10.81 in 1968 as against Rs 11.22 in 1967.

3/ Source: Marine Products Export Promotion Council, Ernakulam.

Table K- 4

Average C.I.F. Value of Indian frozen[4/] Froglegs (per kg) in Different Markets

(in rupees)

Market	1963	1964	1965	1966	1967	1968
USA	5.60	4.23	4.90	9.50	9.97	8.63
France	8.90	7.65	8.06	10.75	13.63	14.44
Belgium	-	-	-	9.75	12.60	14.02
Italy	-	2.69	-	-	14.78	11.43
West Germany	-	-	-	13.30	13.85	11.68
Australia	2.11	6.10	5.64	9.73	12.46	14.42
Total unit value	6 6.21	4.98	6.08	10.01	11.22	10.81

Quality Control

The Government of India have laid down standard specifications for frozen froglegs and enforced a scheme for the compulsory quality control and pre-shipment inspection for froglegs, since March 1966. Since October 1969 no consignment of frozen froglegs is allowed to leave the shores of Indian unless it has been inspected and certified by the Export Inspection Agency, that it conforms to the prescribed standards. The microbiological requirements prescribed standards which are as follows:

i) Total bacterial count at 35°C per gram, maximum	500,000
ii) E. Coli, count per gram, maximum	10
iii) Salmonella, per gram	nil

4/ Source: Marine Products Export Promotion Council, Ernakulam.

These standards fully satisfy the requirements laid down by the importing countries.

Prospects

Although there is a large demand for froglegs in the overseas markets, the supply so far has not been able to catch up with the demand, and there is need for strengthening the supply base by undertaking frog culture experiments on large scale. It is reported that experiments for frog culture are conducted by some State Fisheries Departments and Central Inland Fisheries Research Institute, Barrackpore. If these experiments are successful, it will be possible to promote large scale farming of frogs. In addition, efforts should be made to organise collection of frogs in a systematic manner and to establish freezing units for processing them at suitable frog collection centres. With a view to conserving the frogs, catching of frogs during their breeding season (June to August) should be prohibited.*

In view of the high prices offered by the processors, even frogs of small sizes are being collected at present, thereby posing a threat to the fuller growth of frogs. This is disadvantageous, for the smaller the size, the lower will be unit value realisation. Hence it is suggested

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* The Government has since issued a motification to this effect.

that froglegs of counts below 80 per kg. should not be allowed to be exported and a ban to this effect be imposed. Strict adherence to quality standards, proper grading and improvement in packing will help to boost the exports of frozen froglegs from the country and fetch higher prices than at present. It is envisaged that if the steps outlined above are implemented, it will be possible for India to increase the exports of froglegs from 565 tonnes in 1968 to 900 tonnes in 1973-74 and eventually to build up an export trade of the order of 1,000 tonnes by 1978-79. It is estimated to bring in foreign exchange worth Rs 10.35 million by the end of the Fourth Plan and Rs 11.50 million by the end of the Fifth Plan. Besides USA and France, countries like Belgium, Italy, West Germany and Australia hold out good prospects for exports. The export projections of this item in the major markets are indicated below:

Table K-5: Export Projection for Froglegs

Qty: Tonnes
Val: Rs million

Country	1973-74		1978-79	
	Qty	Val	Qty	Val
USA	315	3.62	350	4.02
France	325	3.73	370	4.23
Belgium	225	2.59	250	2.88
Others	35	0.41	30	0.37
Total	900	10.35	1,000	11.50

1.12 Fish Meal

Production

Fish meal is the principal industrial product of the fishing industry. Peru is the leading fish meal producing country in the world, accounting for about 50 per cent of the world production in 1968. The other important producing countries comprising Norway, South and South West Africa, Chile, Iceland and Angola account for a further 30 per cent of the total production. World production of fish meal in recent years in major countries is indicated below:

Table L-1

Production of Fish Meal by Major Countries 2/

(Thousand tonnes)

Country	1961	1962	1963	1964	1965	1966	1967	1968	% share of the Total in 1968
Peru	840	1,117	1,132	1,553	1,282	1,471	1,816	1,922	49.76
Norway	135	108	134	189	319	422	492	402	10.40
South & South West Africa	179	204	238	253	268	258	345	469	12.14
Angola	55	33	33	55	46	55	44	45	1.16
Chile	41	79	96	166	81	194	131	187	4.84
Iceland	47	103	87	118	173	182	113	53	1.37
Total (incl. others)	2,232	2,686	2,707	3,469	3,407	3,787	3,615	3,862	100.00

2/ Source: United States, Department of the Interior, 1968.

Trends in Production. Between 1961 and 1968, world production of fish meal rose from 2.2 million tonnes to 3.9 million tonnes representing an average annual growth rate of 8.5 per cent. Production of fish meal from Peru registered a substantial increase from 0.8 million tonnes in 1961 to 1.9 million tonnes in 1968, an annual increase growth rate of 13.0 per cent.

Chile, South and South West Africa produced considerably more meal in 1968 than in 1967, the increase in percentage being 43 per cent for Chile, and 36 per cent for South and South West Africa. The output of Norway which had recorded an appreciable rise between 1961 and 1967, was down by nearly one-fifth in 1968. Iceland's production in 1968 was also less than half of 1967. It is reported that the drop in catch of herring in 1968 was the major reason for the lower production of fish meal in Iceland and Norway.

India's production of fish meal is negligible. The total production is estimated at 8,000 tonnes per year, which is mainly consumed in the domestic market for poultry and cattle feed. The slow development of this industry is mainly attributed to the inadequate and irregular supply of cheap shoaling fish.

Processing

At present there are only five plants in India, one each in Jaffrabad, Bombay (capacity 15 tonnes/day), Malpe (capacity 15 tonnes/day), Calicut (capacity 1 tonne/day) and one in Mandapam (capacity 50 tonnes/day) under the Indo-Norwegian Project which has not yet gone into production. The plant at Bombay is at present engaged in the conversion of dried fish into fish meal.

Fish meal is manufactured both by dry and wet processes. In the dry reduction process, the material is crushed to small pieces and cooked in a chamber externally heated by steam, while it is kept stirred. The dried resudue forms the meal. In the wet process, steam is passed directly into the mass at high pressure and the cooked fish pulp is passed into a press to remove water and oil. In this process, oil is also collected as a by-product.

Quality Control

Recently the ISI has formulated standard specifications for fish meal. These specifications are shown below:

	Grade I	Grade II
1. Moisture % by weight - maximum	10	10
2. Crude Protein % by weight - minimum	60	50
3. Cod Fat/extract % by weight - maximum	10	10
4. Acid insoluble ash % by weight - maximum	3	5

In addition, the specifications stipulate that -

(a) The particle size shall be such that all pass through 2.8 mm I.S. Sieve;

(b) the material shall be free from adulterants, insect or mite infestation and from visible fungal growth;

(c) the material shall be free from Salmonella.

Exports

Fish meal occupies a prominent place in the international marketing of by-products of fish with an export of well over 3 million tonnes representing 88 per cent of the world output of fish meal. Bulk of these exports originate from Peru, Norway, Angola, Chile, Denmark, South & South West Africa and Iceland and are directed mainly towards USA, West Germany and Netherlands.

Between 1961 and 1968 world exports of fish meal rose from 1.2 million tonnes (valued at $ 103 milli6n) to about 3.4 million tonnes (valued at $ 374 million) representing an increase of about 16 per cent over the period.

Peru dominates the world fish meal trade, with a share of about 61 per cent in 1968. Its exports increased from 0.7 million tonnes (valued at $ 50 million) in 1961 to about 2.0 million tonnes (valued at $ 204 million) in 1968, or at an average annual growth rate of 16.2 per cent.

The second major exporter is Norway which shipped 436,000 tonnes in 1968. About 21 per cent of Norway's meal was directed to the US market. While South and South West Africa supplied nearly 10 per cent of the world requirements, the export share of Denmark was 6 per cent. The main reason for the rapid expansion of fish meal in international trade is found in the increased catch of "anchovies" off the Peru coast.

Since domestic demand at a price higher than international market exercises considerable pull on fish meal, exports of this item from India have been negligible and intermittent. It exported 118 tonnes in 1965-66 and 295 tonnes in 1968-69 to West Germany.

Exports of Fish meal by major countries are shown in Table L-2.

U.S. Imports of Fish Meal

The United States imported a record quantity of fish meal in 1968 amounting to 855,300 tonnes. The amount is about one-third more than in 1967 and nearly double the 1963-67 average. Nearly three-fourths of these imports came from Peru in 1968 compared to about two-thirds in 1967, as seen from Table L-3. . Chile supplied

Table I-2

Exports of Fish Meal by Major Countries[2/]

Qty: Thousand tonnes
Val: Thousand US dollars

Country		1961	1963	1964	1965	1966	1967	1968
Angola	Q:	50	280	354	48	54	37	44
	V:	4688	3017	6155	6075	7661	9481	4728
Chile	Q:	41	86	146	67	183	114	176
	V:	3491	9233	15961	7932	25349	12415	17411
Iceland	Q:	70	97	122	145	170	131	62
	V:	8383	12637	17488	24963	28942	18658	6904
Denmark	Q:	34	59	56	65	95	120	203
	V:	4150	8265	8939	12326	15588	15887	27466
Norway	Q:	127	104	183	260	258	495	436
	V:	15405	14044	26120	46130	27363	74402	61272

Contd...

2/ Source: Yearbook of Fishery Statistics., 1968, FAO.

Table L-2 (Contd.)

Country		1961	1963	1964	1965	1966	1967	1968
Peru	Q:	708	1038	1426	1413	1302	1595	2078
	V:	49555	104530	143453	155522	181666	173274	204377
South & South West Africa	Q:	169	214	245	233	172	289	314
	V:	14909	21125	23948	22410	17573	27363	29243
Total incl. others	Q:	1200	1716	2329	2352	2339	2893	3400
	V:	103000	186127	259014	298418	347068	350016	374000

103,900 tonnes of fish meal to the US market in 1968 - 2½ times the amount shipped in 1967. Imports from Norway were 41,000 tonnes - about one-third the amount imported in 1967 but 1½ times the 1963-1967 average. The average price of Peruvian fish meal in US market in 1968 was $ 130.95 as against $ 130.15 per tonne in 1967. Norwegian price of fish meal in 1967 ranged between $ 140 and $ 145 per tonne. The US imports of fish meal from major countries are shown below:

Table I-3

US Imports of Fish Meal by Country of Origin 3/

Qty: Thousand tonnes

Country	1963-67 (Average) Qty	%	1967 Qty	%	1968 Qty	%
Canada	48.0	11.0	46.6	7.2	65.1	7.6
Chile	34.5	7.9	40.9	6.3	103.9	12.2
Norway	27.2	6.2	113.2	17.4	41.0	4.8
Peru	312.5	71.5	442.5	67.9	634.2	74.1
South Africa & South West Africa	8.5	1.9	-	-	-	-
Total	437.1	100.0	651.5	100.0	855.3	100.0

3/ Source: United States Department of the Interior, Washington USA, 1968.

Fish Meal Industry in Selected Countries

Peru. Peruvian fish meal output has shown dynamic growth since the early 1950's largely as a result of phenomenal increase in the anchovy catch which accounts for approximately 98 per cent of the fish caught off the Peruvian coasts. Production of fish meal rose from 12,000 tonnes in 1953 to 1.8 million tonnes in 1967 and about 1.9 million tonnes in 1968. Peru's domestic consumption of fish meal appears to have levelled off at about 30,000 tonnes.

Virtually the whole of Peru's expanding fish meal production has moved into export markets. During the period 1957-59 Peru had only three sizeable export markets - the United States, West Germany and the Netherlands. Although these countries continued as Peru's top markets after 1959, new markets were found in Spain, Italy, Japan, Yugoslavia, East Germany and many other countries as production increased. During 1967, exports of fish meal reached 1,595,000 tonnes. Exports in 1968 assisted to a large extent by the record stocks carried over from 1967 reached a new peak, exceeding those of 1967 by more than 30 per cent. Fish meal sales are handled primarily by

exporter-groups in Peru. There are four associations that handle an estimated 90 per cent of the fish meal exports.

A relatively new development is taking place in the shipment of Peruvian fish meal. Till recently all fish meal exports were made in bags and bulk shipments were not undertaken because of the fear that the meal might get over-heated and cause a fire, the heat being generated by the oxidation of the fat in the fish meal. By the development and use of an antioxidant which is reported to slow down the oxidation process, thus reducing the likelihood of fires, it can now successfully be exported in bulk. As a result of this change over from bag to bulk shipments, savings can be effected in a number of ways. One of these is the cost of bagging, estimated at about $ 7 per tonne. Space requirements for bulk shipment are less than for bagged shipment and, therefore, freight costs would definitely be reduced. Bagged fish meal occupies about 80 to 84 cubic feet per tonne. Bulk shipments, which do not require ventilation, occupy about 60 cubic feet per tonne. The importance of the fish meal industry to Peru can be measured by its contribution to the country's foreign exchange earnings. In 1958, when the fish meal industry was in its early stages of development, fish

product exports contributed about 7 per cent to Peru's foreign exchange earnings. In 1961 this percentage had increased to 14, and in 1967 it was 27 per cent.

Recognising the importance of the fish meal industry. to the country, the Peruvian government has taken several steps during the last few years to assist the industry. In the later part of 1967, the government decreed that no duties would be required to be paid on exports of the product.

Norway. Norway is the second largest producer of fish meal in the world. It produced a record total of about 492,000 tonnes in 1967. Large catches of herring, mackerel and capelin are responsible for the record production in 1967. Its production has, however, gone down to 402,000 tonnes in 1968.

The current high level of the Norwegian industry is the result of an improvement in the catches of certain species, notably herring, by the extensive use of modern purse seiners, and the exploitation of new fishing grounds for herring in the North Sea.

The purse-seine fleet accounts for 90 per cent of all pelagic fishery landings. Over 96 per cent of pelagic landings are used by the reduction industry. The entire

catches of capelin, Norway pout and sand eel, 88 per cent of the herring and 95 per cent of mackerel catches are used in the fish meal industry. Herring is, however, the principal species used by the reduction industry.

The resource base of the fish reduction industry is relatively sound, although the availability of the important species is subject to extreme fluctuations or even disappearance.

Unless new fishing grounds are discovered or new method utilised, which will enable presently unutilised species to be harvested economically, herring, mackerel and capelin will continue to be the foundation of the industry. The intense exploitation of herring and mackerel stocks in the North Atlantic is causing concern over the state of resources.

Fish meal is produced in Norway in approximately 82 factories with a total capacity utilisation of 50,000 tonnes of raw materials per day.

Most plants depend on seasonal fisheries and are, therefore, equipped with capacities for large output during relatively short periods. However, there is a shortage of processing capacity vis-a-vis the volume of

raw fish caught. The ban on fishing during the later part of 1966 was a much as result of the inability of the plants to handle such large quantities of fish as it was to the high stocks and low prices for fish meal prevailing in the world markets. Production capacity needs to be increased by approximately 50 per cent to equal the fleet capacity. Almost all the fish meal produced is exported, mainly to the United Kingdom, France, Netherlands, Sweden, West Germany and USA. The first year in which significant amounts of fish meal were shipped to the USA was 1966 when 21,000 tonnes were exported to that country. This figure increased to over 113,000 tonnes in 1967.

Marketing of fish meal in Norway is controlled by a Central Organisation (NORSILDMEL). This organisation controls shipments and has imposed a high degree of quality control. Export prices are under government control, as are prices for the catch.

Unlike the Peruvian industry, the Norwegian industry developed with the active participation and cooperation of a number of groups representing fishermen, producers and industrialists.

Prospects

Under the present condition of inadequate and irregular supply and high prices of raw materials, export prospects of fish meal may not seem to be bright. The only raw material utilised at present is the trash fishes from shrimp trawlers. The present price of raw material at the landing places ranges between Rs 180 and Rs 250 per tonne. With about 20 per cent towards processing cost, one tonne of finished meal costs a minimum of Rs 1,080 per tonne, whereas the international FOB price works out to Rs 800 per tonne thereby making Indian product uncompetitive price-wise in foreign markets. India can hope to make a dent in the international market only if it is possible to reduce the cost of raw material (a) by increasing its landings and (b) by developing large scale processing and filleting of fish and making the trimmings available to the fish meal industry at a low price.

The rapidly growing demand for fish meal in the world market and the large potential available for sardine fishery on the west coast offer India an excellent opportunity for entering the world trade in fish meal in a big way. For this purpose, it is essential that fish meal plants should be set up at important centres like

Calicut, Cannanore and Mangalore, where there are good concentrations of sardines. Along with the establishment of these units, efforts should be made to increase the sardine catches. Miscellaneous varieties of cheap fishes like Caranx, silver belly, jew fish, ribbon fish landed by shrimp trawlers, which do not find a ready market can also serve as raw material for the reduction industry. In addition to this, efforts should be made for the proper collection of wastes in the form of heads and shells and other trimmings from the freezing and canning units, for utilising them as raw material for the fish meal plants.

Taking into account the growing world demand and the measures suggested above for developing the fish meal industry on a large scale, it should be possible for India to develop an export trade of 500 tonnes valued at Rs 0.50 million by 1973-74, and eventually reach a target of 7,330 tonnes valued at Rs 6.97 million by 1978-79. The countries that offer scope for importing fish meal from India are West Germany, East Germany, Poland, Netherlands, and Italy. Recently Spain has also shown interest in importing fish meal from India provided strict adherence to international standards, regularity of shipments in

quantities not less than 5,000 tonnes at a time, and good packing in moisture proof bags can be ensured. The export projections of this item in the major markets are shown in the table below:

Table L-4

Export Projections for Fishmeal

Qty : Tonnes
Val: Rs million

Country	1973-74 Qty	1973-74 Val	1978-79 Qty	1978-79 Val
West Germany	175	0.18	2,300	2.25
East Germany	150	0.15	2,100	1.98
Poland	125	0.12	2,000	1.85
Others	50	0.05	930	0.89
Total	500	0.50	7,330	6.97

1.13 Fish Oil

Background

Fish oil is divided into two main categories - fish liver oil and fish body oil. The former is used for medicinal purposes and the latter is at present mainly used as a preservative for boats. The present method of extraction of fish oil used in India is somewhat crude with the result that the product is of a poor quality. It is understood that the oil could be extracted by the

improved methods in use in some of the foreign countries. It will considerably improve the quality of the product and it can then be used for the preparation of a variety of useful industrial products such as factice (rubber filling compound), water repellant paints, printing ink and lubricating oil additive. Hydrogenated fish oil can also be considered for use in soap or for margarine production. Refined and slightly polymerised fish oil is presently used in many countries as a medium for canning fish.

Production

The following table provides the world production of fish oil by major countries:

Table M - 1

World Production of Fish Oil[1/]

(Thousand tonnes)

Country	1961	1963	1964	1965	1966	1967	1968	% share in 1968
Peru	118.9	154.9	212.1	124.8	146.7	291.8	349.0	30.0
Norway	44.0	64.5	96.1	178.2	237.9	337.4	243.2	21.0
Iceland	46.2	55.0	91.0	103.6	130.5	73.9	20.4	1.8
Denmark	17.3	27.9	34.8	40.0	37.0	63.0	70.2	6.1
USA	119.1	83.3	80.3	87.4	73.8	54.4	77.8	7.0
South & South-West Africa	59.4	48.1	70.0	59.3	50.7	64.6	123.5	11.0
Total incl. others	602.0	618.0	776.0	785.0	887.0	1111.0	1149.0	100.0

1/ Source: Yearbook of Fishery Statistics, FAO, 1968.

Trends in Production. World production of fish oil increased considerably from 0.6 million tonnes in 1961 to 1.1 million tonnes in 1968, witnessing an increase of 84 per cent. Norway, Peru, Iceland, Denmark and USA are the major fish oil producing countries in the world. Peru is the largest fish oil producing country contributing 30 per cent to the world production in 1968. Its production increased from 118,900 tonnes in 1961 to 349,000 tonnes in 1968, or at an average annual growth rate of 16.1 per cent. Norway ranks second in the production of fish oil. Its production increased from a low level of 44,000 tonnes in 1961 to 243,200 tonnes in 1968, or at an average annual growth rate of 16.6 per cent. Its share in the world production, as a result, has increased from 13 per cent in 1961 to 21 per cent in 1968. South and South-west Africa (123,500 tonnes), USA (77,800 tonnes), Denmark (70,200 tonnes) and Iceland (20,400 tonnes) are other important fish oil producing countries of the world which together account for about 26 per cent of the total production.

India's share in the total production of fish oil is negligible. Statistics regarding India's production of this item are not available. However, it is reported that

the production is roughly of the order of 3,000 tonnes per annum.

Exports

World exports of fish oil were 684,000 tonnes (valued at $ 58 million) in 1968 as against 335,000 tonnes (valued at $ 51 million) in 1961. More than half of the exports is accounted for by Peru and Norway. Peru is the largest exporter of fish oil contributing 45.3 per cent to the world exports followed by Norway with a share of 12.5 per cent. Iceland (33,800 tonnes), USA (29,500 tonnes), Denmark (56,400 tonnes) and South-West Africa (73,800 tonnes) are other important exporters accounting for a further 28 per cent. In 1968 exports of fish oil from Peru and Norway were of the order of 310,600 tonnes and 85,000 tonnes respectively. A major part of the exports is absorbed by West Germany (21 per cent) and Netherlands (22 per cent). Denmark, Belgium and Sweden constitute other important importers of fish oil. World exports of fish oil is given in Table M-2

India's exports of fish oil during 1968-69 were about 148 tonnes (valued at Rs 246,000) and were directed towards the iddle East countries viz; Kuwait, Iraq, Trucial Oman and Bahrein Islands.

Table M-2

World Exports of Fish Oil[2/]

Qty: Thousand tonnes
Val: Thousand US dollars

Country		1961	1963	1964	1965	1966	1967	1968
Peru	Q:	102.3	125.5	110.6	137.5	87.4	192.7	310.6
	V:	10845.0	8103.0	14074.0	22840.0	14928.0	19573.0	22559.0
Norway	Q:	26.7	24.3	24.3	55.0	99.0	184.5	85.5
	V:	5690.0	4890.0	11758.0	18268.0	18268.0	23348.0	8529.0
Iceland	Q:	32.0	64.5	62.2	88.5	132.7	79.0	33.8
	V:	444.0	8652.0	11833.0	17321.0	21945.0	10380.0	3230.0
USA	Q:	55.6	119.0	68.7	46.9	34.7	84.6	29.5
	V:	8908.0	15636.0	13096.0	8966.0	7289.0	4560.0	2701.0
Denmark	Q:	9.4	21.1	30.6	49.7	34.5	62.7	56.4
	V:	1348.0	2771.0	5092.0	9810.0	6398.0	8296.0	5382.0
South & South West Africa	Q:	52.0	32.1	44.6	35.3	24.6	24.6	73.8
	V:	6139.0	3837.0	7570.0	6915.0	4277.0	3873.0	5746.0
Total incl. others	Q:	335.0	458.0	417.0	473.0	481.0	641.0	684.0
	V:	51000.0	54811.0	72240.0	90309.0	85859.0	79820.0	58000.0

2/ Source: Yearbook of Fishery Statistics, FAO, 1968.

Prospects

Elsewhere, proposals have been made for increasing the catch of sardines by engaging off-shore fishing on a large scale with the object of taking up the processing of sardines and/or preparation of fish meal for export abroad. As the Government of India has placed a ban on the import of olive oil, the canning of sardines is at present being undertaken with groundnut oil as a packing medium. The Survey has revealed that the foreign consumers prefer olive oil or fish oil to groundnut oil. Since it would be more economical to use fish oil for the canning of sardines, it is suggested that the plants that are to be installed for the preparation of fish meal from sardines should be of the composite type which could simultaneously produce oil as well as fish meal.

1.14 Fish Maws and Shark Fins

Background

Fishmaws are dried air bladders of fish. Indian salmon, jew fish, cat fish and eels are the important varieties of Indian fishes that yield quality air bladders and serve as important raw materials for fishmaws. Sharkfins

are the caudal, dorsal and pactoral fins of the bigger species of sharks.

Data on world production of fishmaws and sharkfins are not available. However, India is considered to be one of the largest producers of fishmaws and sharkfins. Other important producers of fishmaws comprise Malaysia Pakistan, Thailand, Indonesia and Cambodia. Japan is the leading producer of sharkfins. This is attributed mainly to the large landings of sharks in that country. Pakistan has recently emerged as one of the major producers of sharkfins. In India, the sharkfins and fishmaws industry has developed in the states of Tamil Nadu, Gujarat and Maharashtra. Most of the units are run on cottage industry basis.

Processing

As processing of fishmaws and sharkfins is very typical in character, a few conspicuous features are outlined below:

Fishmaws

The fish is out open and the internal membranes containing the air bladders are removed and washed in water till they are free of blood.

They are then dried in the sun till they are hard and beaten against wood and flattened. The bladders are then pulled into shreds by hand, dusted with lime and dried in the sun.

The fishmaws are graded into the following sizes and packed in moisture proof containers, usually polythene lined wooden boxes or gunny bags.

Grades

Tiny - Maws weighing 35 g and below
Small - Maws weighing 36 g to 100 g
Medium - Maws weighing 101 g to 170 g
Large - Maws weighing 171 g to 250 g
Jumbo - Maws weighing above 250 g

Sharkfins

The dorsal and tail fins from big sharks of about 5 ft. or more in length are cut and freed from adhering flesh and washed well. The fins are dusted with salt in the ratio 1:10 and kept for 24 hours. At the end of this period the fins are dried in the sun to a moisture content of about 7 to 8 per cent.

The dried fins are graded according to colour, size and species and packed in moisture proof containers. The following are the sizes

into which they are graded.

Grades

Small	-	Fins weighing 50 g and less
Medium	-	Fins weighing 50 g to 150 g
Large	-	Fins weighing 151 and above.

Exports

Exports of fishmaws and sharkfins have increased considerably in recent years as these products are becoming popular in foreign markets for the preparation of soups. Data on world trade in fishmaws and sharkfins are not available. However, India, Pakistan and Malaysia are reported to be the principal exporters of fishmaws, while Japan is the largest supplier of sharkfins contributing about 75 per cent to the world exports. Other important exporters of sharkfins are India and Pakistan. In recent years Malaysia has also entered the export trade of this item.

Trends in Exports. In India virtually the entire output of fishmaws and sharkfins is exported. Exports of these products increased from 235 tonnes in 1962-63 to 319 tonnes in 1967-68, registering an increase of about 36 per cent.

In 1968-69 there was a fall in the quantum of export by 15 per cent over the level of 1967-68. But the value realised per tonne increased considerably. It rose from Rs 12,269 per tonne in 1967-68 to Rs 15,336 per tonne in 1968-69. This is attributed to the recent shift in the direction of exports from the traditional markets to new markets like UK where they fetch a higher unit value. Exports of fishmaws and sharkfins from India since 1962-63 are shown below:

Table N-1

Exports of Fishmaws & Sharkfins[1/] from India

Qty: Tonnes
Val: Thousand rupees

Year	Qty	Val
1962-63	235	2,382
1963-64	394	3,455
1964-65	344	2,616
1965-66	213	1,724
1966-67	185	2,114
1967-68	319	3,915
1968-69	271	4,156

1/ Source: Marine Products Export Promotion Council, Ernakulam.

Direction of Exports

Singapore and Hong Kong have been the traditional markets for sharkfins and fishmaws. But in recent years UK has emerged as one of the major importers of these items from India. During 1968-69 the shares of Singapore, UK and Hong Kong were 49, 30 and 19 per cent respectively.

Prospects

The overseas markets with growing demand for sharkfins and fishmaws, jew fish etc., coupled with the anticipated increase in the landings of sharks and other fishes used for making fishmaws (e.g. Indian salmon, jew fish and eel) as a result of the measures recommended in the survey report, offer considerable scope for stepping up the exports of these items from India.

The essential pre-requisites for expanding the export trade in these items is that Indian products should be improved in quality to compete with those of other supplying countries by adopting the latest methods for the cutting, processing, grading and packing of the fins. There seems to be a practice among the exporters to leave a portion of the flesh while cutting the sharkfins. This is unnecessary as the importers invariably cut out the

dried meat portion of the fins and settle the price on the basis of the actual size. This inevitably results in a lower price realisation than what is normally expected by the exporter. Therefore, the practice of cutting the sharkfins with some flesh should be given up. This would, by reducing the weight, yield some savings in the freight charges paid by the exporter. There is at present no proper grading of sharkfins by sizes since fins of various sizes are mixed together, and the price realisation is based on the average of different sizes. They should, therefore, be properly graded by size to realise higher unit values. The products sometimes suffer loss in weight, due to evaporation of moisture during the voyage, as a result of which they frequently do not conform to the sample. Exporters should take note of this and ensure that the goods are properly packed in moisture proof polythene bags. Besides, it is necessary that the exports should conform to the standards (ISI) prescribed by the preshipment inspection rules framed under voluntary inspection.

Sharkfin as such is only a raw material. The finished product which is used for making sharkfin soup is the translucent cartilagenous rods embedded in the fin.

This finished product if attractively packed in air-tight plastic bags will find better demand in all the overseas markets especially in UK.

It is envisaged that if the above improvements are effected, Indian sharkfins and fishmaws can sell at premium prices in overseas markets. It is estimated that the exports of these products can be increased to 300 tonnes valued at Rs 4.60 million by 1973-74 and to 400 tonnes by 1978-79 to realise a foreign exchange earning of Rs 6.10 million. The market-wise export projections of these items are shown in the table below:

Table N-2

Export Projections for Fishmaws and Sharkfins

Qty: Tonnes
Val: Rs million

Country	1973-74		1978-79	
	Qty	Val	Qty	Val
Singapore	158	2.22	212	3.24
UK	64	0.92	100	1.28
Hong Kong	75	1.05	84	1.52
Others	3	0.41	4	0.06
Total	300	4.60	400	6.10

1.15 Seaweeds

Background

Seaweeds comprise two main varieties - the edible and the inedible. The former is one of the necessary and special items of food in Japan where it is consumed in dried forms. It is also used as fodder and fertilizer. The latter is used for the extraction of agar agar and algin which is widely used in many industries.

The production of seaweeds is generally restricted to the relatively narrow-littoral and sub-littoral belts of the marine environment.

Production

World production of seaweeds witnessed a rise of 44.4 per cent during 1961 to 1968 when it increased from 620,000 tonnes in 1961 to 890,000 tonnes in 1968. Table 0-1 given the world production of seaweeds by major countries.

Table - 1

World Production of Seaweeds[1/]

Country	1961	1963	1964	1965	1966	1967	1968
Japan	424.8	425.7	361.0	406.3	436.7	534.0	503.5
South Korea	40.0	58.0	61.6	61.0	69.6	87.8	119.5
Norway	72.1	56.9	63.6	84.8	55.1	61.0	63.6
USSR	-	64.0	64.9	72.0	64.6	74.8	60.9
Canada	18.5	22.5	19.8	25.0	30.1	44.1	46.5
Argentina	10.1	8.3	10.2	19.9	29.6	32.8	24.8
Total incl. others	620.0	690.0	640.0	720.0	750.0	900.0	890.0

Japan is the largest producer of seaweeds accounting for 56.5 per cent of the world production in 1968. Its production increased from 424,800 tonnes to 503,500 tonnes during 1961-68, showing 18.5 per cent rise. The next important producer is South Korea which contributed 119,500 tonnes or 13.4 per cent of the total production in 1968. The other major producers are Norway (63,600 tonnes), USSR (60,900 tonnes), Canada (46,500 tonnes) and Argentina (24,800 tonnes).

1/ Source: Yearbook of Fishery Statistics, FAO, 1968.

Information regarding seaweeds production in India is not available. It is, however, reported that there are several areas along the coast which offer suitable environment for the growth of seaweeds of commercial value. Mandapam, Pamban, Rameshwaram, Keelakarai, Tuticorin, Kanyakumari, Muttam and Colachel in Tamil Nadu, Visakhapatnam and its environs in Andhra Pradesh, Chilka Lake in Orissa, Okha, Dwarka and Veraval in Gujarat and Kovalam and Vizhingom in Kerala are some of the potential areas along the Indian coast for commercially valuable seaweeds. Laccadives, Andamans and Nicobar Islands are also noted for their rich seaweed resources.

Exports

Statistical information regarding world exports of seaweeds is not available. It is, however, reported that Japan is the major market for seaweeds. In spite of its huge production, Japan imports a sizeable quantity of seaweeds from various countries like South Korea, USSR, etc. A beginning was made by India in the export of this item in 1966-67 when it shipped 277 tonnes (valued at Rs 424,000) and only 62 tonnes (valued at Rs 145,000) in 1968-69. Lately the Government of India have placed a ban on the exports of seaweeds in view of the internal demand for preparation of agar agar and other organic chemicals.

Japan is the only country which has been regularly taking some supplies of seaweeds from India since 1966-67, through on a diminishing scale. Spain and USA also figured for small quantities in 1966-67 and 1967-68 respectively.

Prospects

Despite the growing domestic demand for seaweeds in the agar agar industry, there are certain other varieties of edible seaweeds (not used in the agar agar industry) which can be readily marketed. In order to encourage the export of non-industrial seaweeds, it is suggested that the ban on such varieties of seaweeds as are not required for industrial uses be lifted. It is understood that as a result of the ban, there has been a perceptible fall in the collection of seaweeds, particularly on the Mandapam and Rameswaram coasts. The lifting of the ban as suggested above, would give a filip to the collection of seaweeds both for industrial and non-industrial uses. The former can be used for the industry and the latter utilised for export. Measures will also have to be taken for organising the collection of the seaweeds in a systematic manner.

Market studies reveal that there is a growing demand for seaweeds in the Japanese market, a part of which is at present met by imports from South Korea. It should not be difficult for Indian exporters of seaweeds to supply to the Japanese market because of the high quality of the Indian product which can be shipped at competitive price.

2. EXPORT PROSPECTS

The Survey has revealed ample scope for expanding exports of a variety of fishery commodities to USA, Japan, Australia, Canada, West Germany, France, Italy, UK and a few countries in Africa and South East Asia. North American and West European markets will provide outlets for the bulk of the frozen and canned seafoods while Ceylon, Hong Kong, Singapore, Mauritius and East African countries will continue to remain principal buyers of dried fish and fishery by-products. The oversea survey has highlighted that the future of India's marine products industry lies in frozen and convenience foods such as breaded shrimp, shrimp in IQF form, fish sticks, fish sausages, fish paste, flakes etc. In fact the industry should on immediate basis must be ready to offer cooked or even precooked ("heat-and-eat") items if a maximum export effort is to be attained in overseas markets. Items, having export potential are shrimps - frozen, canned and dried, frozen froglegs, frozen lobstertails, canned sardines, tuna, eel, mackerel, dried fish including Bombay duck and fish meal. Conforming to the consumers taste if fish like pomfret, dara, perches, seer, etc. are frozen either as whole or in fillets can find acceptability in the affluent market.

Viewed against this background, an attempt has been made for the commodity-wise and destinationwise prospects of exports of marine products in selected countries.

2.1 USA

The USA is the principal and the most lucrative market for Indian seafood sharing 55 per cent of the total exports of marine products in 1969. At present the major items marketed in the USA are frozen, canned and dried prawns, frozen froglegs, frozen lobstertails and frozen fish. Emperical evidence suggests that there has been a gradual increase in the US participation in the expansion of India's marine products exports during the past decade.

The Survey has estimated that the US market alone would be able to absorb a large proportion of the projected increases of marine products by 1973-74 and 1978-79 as summarised overleaf.

Table P-1 : Export Projection of Marine Products to USA

Item	1973-74 Qty (Tonnes)	1973-74 Val (Rs million)	1978-79 Qty (Tonnes)	1978-79 Val (Rs million)
Frozen shrimp/Prawn	20,520	292.00	27,500	403.00
Canned shrimp	1,350	15.90	1,800	23.00
Froglegs	315	3.62	350	4.02
Lobstertails	400	9.60	1,960	34.80
Frozen fish	15	0.13	4,110	12.50
Canned sardines	30	0.18	360	2.10
Total	22,630	321.43	36,080	479.82

Shrimp. USA is the principal and the most attractive market for Indian frozen shrimp. Despite competition from meat and poultry products and a static level of per capita fish consumption at 11 lbs, the per capita shrimp consumption, of late, has been showing an upward trend in US from 1.04 lbs in 1961 to 1.41 lbs in 1968, thereby showing an increase of 35 per cent. It has been estimated that in the next decade and half this growth rate will be maintained in the US market. This has been corroborated by the rising imports of shrimp during recent years from 238 million pounds in 1961 to 389 million pounds in 1968.

The shrimp exporting countries to the US market are over 60, principal being, Mexico, India, Panama, Guyana, French Guiana, Ecuador, Venezuela and Pakistan. Indian

shrimp thus faces stiff competition from the Mexican, Panaman and Pakistani shrimp. Yet another growing shrimp exporting country from Asia is Thailand and is expected to offer competition to the Indian product.

Based on the import data for 1968, it would be seen that India figures as one of the principal sources of frozen shrimp in various forms next only to Mexico. But its unit value realisation has been far less compared to other suppliers. Whereas Mexico netted $ 1.01 per pound for peeled frozen shrimp and Nicaragua $ 1.01, India's realisation per pound was of the order of $ 0.47. This is far below the average realisation of $ 0.79 per pound [illegible] aggregate shrimp imports from all sources in USA. Japan and Chile are the principal competitors for peeled and cooked shrimp in this market, realising $ 0.37 per pound. The relatively lower earnings of Indian shrimp have been largely ascribed to traditional method of processing in block form, instead of IQF and 'ready to cook' items, practice of grading and products on finished count basis, and larger proportion of smaller sizes.

USA is also a principal market for Indian canned shrimp. Here again, the price realisation for the Indian product compared to Japan is less by 20 cents, and does not compare favourably with the average price realisation.

Although shrimps and prawns (shell on) are imported by the US in substantial quantities from Mexico, Panama, Kuwait, Guyana, Indian exporters have not made much headway so far in the supply of this product. If the Indian exporters can offer at a price ranging between $ 0.88 and $ 1.00 per pound, consumer acceptance for the product, can be obtained with ease.

Lobster tails. Lobster tails are imported by USA in large quantities. The major suppliers to this market are South Africa, Australia, New Zealand, Brazil, India and Thailand. Whereas the average unit value works out to $ 2.02 per pound, Indian realisation is of the order of $ 1.24 per pound. Australia is fetching higher unit value at $ 2.46 per pound while South Africa, the major exporter, nets $ 1.89 per pound. The price differential is mainly due to the inferior quality of the rock lobsters exported by Indian exporters. Canada figures as the major supplier of live lobsters to the US market. The US also offers possibilities for lobsters in air tight containers and a beginning in this direction has been made by the Indian industry in 1969.

Froglegs. With sustained effort and strict bacteriological tests, India can step up exports of frozen froglegs to this market, despite competition from Japan, Mexico and Pakistan. Although India realises comparably higher unit values at $ 0.57 per lb. than Pakistan ($ 0.53 per lb.) it stands far behing Mexico and Japan, which net higher unit values at $ 0.72 and $ 0.71 per lb. respectively.

Tuna. There is considerable demand for tuna in USA, in fact it constitute the principal market for this variety of fish, with an average annual import of 112 million pounds. Japan and Spain supply over 62 per cent of the US reqirements. The growing American market offers export possibilities for tuna in frozen form. Nevertheless it should be borne in mind that the price quoted by Indian exporters should not exceed those of competitors like UK, Japan and Spain which range between $ 0.13 to $ 0.20 per pound.

Sardines. India will be able to step up sardine landings considerably in the years to come. Canned sardines are imported by USA at present from South Africa, Morocco and Norway. The unit values range from $ 0.15 per pound as in the case of South Africa, and $ 0.50 Morocco and $ 0.32 Norway. Indian sardines can make a dent in the US market only if the product is offered at competitive prices.

Other items which can make inroads into the American market are:

(a) Shrimp in IQF

(b) Breaded shrimp

(c) Fish sticks

(d) Fish sausages

(e) Fish pastes and flakes

(f) Fishmeal and other by-products

2.2 Japan

Besides being a leading exporter of certain specialised fishery commodities, Japan is a significant importer of seafoods. Total imports of seafoods averaged 129,560 tonnes during 1966-68. Frozen tuna, frozen, canned and dried shrimps and frozen salmon constitute the most important items currently imported into the country, Formosa, South Korea, USA, India, Mexico, Thailand, Spain, China(Mainland) and Canary Islands being the major suppliers.

Internal demand of selected varieties of fishery commodities is growing on account of the rapid rise in per capita income and the living standards of the Japanese population. Japan therefore is going to be an important

potential market next to USA for increased sale of sea-foods. At present India's exports to Japan are confined to frozen shrimps.

Mexico is the principal supplier of frozen shrimp, followed by Hong Kong, Thailand, India, China (Mainland) and Pakistan. It will be interesting to note that while Hong Kong and Mexico realise higher unit values in this market, India's realisation is far below the average unit value of the product. Similarly, Pakistan's earnings are also slightly higher than the unit value realised by Indian product. It has been estimated that in keeping pace with the growing consumer preference for shell-on shrimp and frozen lobsters, the Japanese market will continue to be the major outlet for Indian product next only to USA in the coming decade. However, care has to be taken to see that the quality is maintained and the prices are competitive compared to other countries such as, Mexico, Thailand, Pakistan and China (Mainland). The Survey highlights that the Japanese market provides ample opportunities for promoting export of canned tuna, Indian salmon in frozen form, sardines in air tight containers, crab meat, canned and live eel.

2.3 United Kingdom

UK is the second largest importer of fishery commodities in the world ranking next only to USA. Major commodities entering the UK market comprise canned sardines, frozen shrimp canned shrimp trout, frozen lobster, canned tuna and frozen fish. Besides neighbouring European countries, suppliers of these items include, South Korea, Japan and India, Pakistan etc. The percapita consumption for processed marine foods has been showing a steady rise during the past decade and the available indications suggest a continuation of this trend in the coming years.

Although India has been exporting numerous varieties of fishery commodities to the UK market, its exports are mostly confined to canned shrimp. Other items exported in negligible quantities include dried fish, dried shrimp, sharkfins and fishmaws, Exports of these fishery commodities to UK market amounted to 763 tonnes (valued at Rs 8.7 million). Against the large potential offered by UK, this performance is unimpressive.

The UK, is a reasonably well developed and rapidly growing market fro frozen and canned seafoods and offers good prospects for shrimp, lobster tails, crab, tuna,

The bulk of the frozen tuna shipments come from China (Mainland), South Korea, Malaysia and New Herbrides. The unit value realisation is about $ 0.37 per kg. USA is the principal supplier of frozen salmon to this market followed by USSR and to a small extent China (Mainland), the realisation per pound ranging between $ 0.85 to $ 0.91. In view of the anticipated landings of Indian salmon from the deep sea operations, it should be possible for the Indian exporters to exploit this market.

In the next decade, sardines in air tight containers are likely to contribute substantially to Indian exports of marine products. At present South Africa, Norway and Portugal are the principal sources of supply to the Japanese market. The unit value realisation for the product is about $ 0.43 per kg. Efforts should be directed to supply sardines in suitable cans of consumer acceptance.

Although small quantities of crab meat are imported at present mostly from South Korea, Japanese market provides ample scope for the processed crab meat from Chilka Lake (Orissa). Also, efforts can be directed to introduce the 'convenience' foods in the Japanese market for some of the table fish such as filleted pomfrets and Bombay duck, fish sausages, fish pastes etc.

sardines, mackerel frozen fish etc. The table below gives the estimated exports of these items to the UK market by 1973-74 and 1978-79.

Table Q-1 : Export Projection of Marine Products to UK

Item	Qty (Tonnes)	Val (Rs million)	Qty (Tonnes)	Val (Rs million)
Canned shrimp	1,580	18.55	2,100	27.30
Dried Prawn	225	1.50	360	2.40
Lobstertails	30	0.72	147	2.60
Sharkfins & fishmaws	64	0.92	100	1.28
Frozen fish	14	0.13	3,880	11.60
Canned sardines	250	2.60	6,200	18.90
Canned Mackerel	20	0.08	1,000	4.00
	2,183	24.50	13,787	68.68

The market provides ample opportunities for the development of frozen and fresh crustaceans, tuna and frozen fish on a large scale. At present Norway, South Korea, Hong Kong, Australia and China (Mainland) constitute the major provenances of the fresh and frozen shrimp to this market. Small quantities of fresh prawns are procured from Norway. Portugal constitutes almost the sole source for canned sardines. Substantial quantities of tuna are also imported from Japan and Peru. At present

Canada is the only supplier of canned lobsters. In view of the growing demand for these products in this market, Indian exporters should make efforts to promote their exports.

Apart from shrimp, lobsters and tuna the UK market is a principal source for Indian dried fish, notably Bombay duck. In fact the earnings of laminated Bombay duck will be more than trebled if processed suitably in mechanical drying units. Efforts should also be made to introduce fishery by-products and other preparations into this market.

2.4 France

French imports of fishery commodities averaged 118,032 tonnes during 1966-68. Major items of import include shrimp, lobster, salmon, tuna, sardines, frozen fish, fish fillets, molluscs, herring, pilchard, crabs and froglegs. Fish fillets imports come almost entirely from West Germany, sardines are procured from Morocco, and tuna from New Hebrides and Morocco. France figures as a prominent importer of froglegs from India. Its import averaged 147 tonnes during 1964-68. In order to exploit the growing French market for froglegs, it is necessary that considerable efforts may have to be made

for meeting the exacting requirements of the market with regard to quality standards, grading and packaging. The market also offers increasing prospects of canned shrimp, canned sardines, lobstertails and crab. Its imports of canned shrimp from India averaged 267 tonnes during 1964-68. But the bulk of the Shipment come from Senegal, Algeria and Tunisia. Lobster tails requirements of the French market are met from Cuba, South Africa and Irealand: the unit value of which ranges between $ 2.5 to $ 3.0 per kg. Crabs are imported into France mainly from Turkey and Italy. If Indian crabs can conform to the specifications, efforts can be made to capture a part of the market. Nevertheless India will have to face stiff competition from Turkey and Italy.

Sales of seafood in France are largely dominated by institutional markets. It will be in the interest of the Indian processors to set up contacts with major firms serving the retail market with a view to establishing co-pack or similar agreements.

2.5 West Germany

A substantial tonnage of fishery commodities is consumed in West Germany, although the percapita consumption is only around the European average. At present the

market is largely a retail market but institutional sales are growing rapidly. West Germany would contine to maintain her place as one of the principal importers of fish in fresh and canned forms. Japan, Portugal, Morocco and USSR are at present the principal suppliers of canned fish to this market. With necessary promotional efforts it should not be difficult for Indian exporters to capture the market for canned shrimp, sardines, tuna eel and frozen shrimp, and lobster tails.

2.6 Australia

Despite the growing fishing industry in Australia, it is one of the important markets for Indian frozen shrimp in the cooked form. In fact, Australia has been sharing, three per cent of India's total exports during the recent years. China (Mainland) is the leading supplier of frozen shrimp to this market followed by Hong Kong, India and Thailand. Whereas Hong Kong realises unit value of $ 0.87 per pound, India and Thailand obtain a unit value of $0.73 and $ 0.65 per pound respectively in this market. India's unit value realisation is lower mainly due to defective packing and grading.

2.7 South East Asia and Africa

Ceylon, Hong Kong, Singapore and Mauritius are some of the major markets for Indian dried seafoods, Ceylon takes the bulk of dried fish exports, while dried prawns, sharkfins and fishmaws are shipped mostly to Singapore, Hong Kong and Malaysia. Although dried seafood industry is an old and traditional one, the increasing preference for frozen goods notwithstanding, the neighbouring countries will continue to rely on Indian dried fish in the years to come because of the preference for these varieties of fish. Nevertheless much increase in exports is not anticipated in these markets. Promising markets are located in Africa and Middle East, most important being Kenya, Uganda, Tanzania, Nigeria and Senegal. However, with a view to capturing these markets a great deal of promotional efforts are needed.

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